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Electronic Business

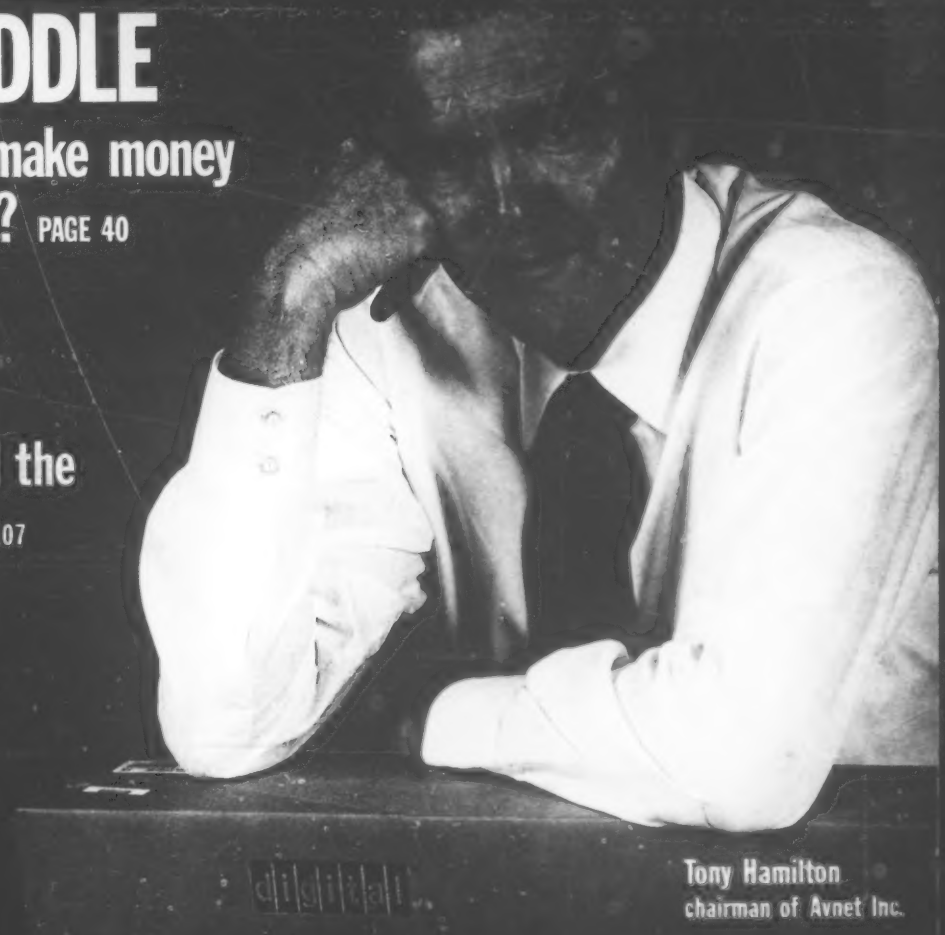
FOR MANAGEMENT IN ELECTRONICS, COMPUTER & SYSTEMS COMPANIES — WORLDWIDE SEPTEMBER 15, 1988

CAUGHT IN THE MIDDLE

Can distributors make money selling computers? PAGE 40

IBM's welcome for Europe 1992 PAGE 16

How SMT surprised the CAD/CAE crowd PAGE 107



Tony Hamilton
chairman of Avnet Inc.

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER AND SYSTEMS COMPANIES—WORLDWIDE

VOL. 14, NO. 18 SEPTEMBER 15, 1988

PAGE 40 Can Avnet's Tony Hamilton make 25%-plus on computer sales?

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The push into the computer business by distributors such as Hamilton/Avnet has far-reaching consequences for all companies associated with computer products. For computer and software vendors, it means the possibility of reaching new markets; for VARs and VADs it means being forced to develop new relationships; and for the end user it means another option in purchasing. Sales growth may not be in question, but profitability and channel conflict are.

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EDITORIAL STAFF

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Editor: Allen Furst

Managing Editor: John Kerr

Assistant Managing Editor: Beth Karlin

Senior Editors: Alden M. Hayashi, Linda Stallmann, Anne Knowles

Associate Editors: Bruce C. P. Rayner, Valerie Rice

Assistant Editors: Anthony E. Greene, Xiong Xiaoge

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Consulting Editor: Alberto Socolovsky

Managing Editor Production: Roger C. Plant

Production Editor: Linda S. Cohen

Assistant Production Editor: Karen J. Covey

ART STAFF

Art Director: Bill Cooke

Associate Art Director: Mike O'Leary

Staff Artist: Christina Rutter

EDITORIAL OFFICES

Boston: Cahners Building
275 Washington Street, Newton, Mass. 02158 (617) 964-3030 Telex: 94 0573 CPC BSN 6502502256 MCI Fax: 617-964-5490

San Jose, Calif.: Valerie Rice
Sherman Building, 3031 Tisch Way, Suite 100, San Jose, Calif. 95128 (408) 296-0868

Irvine, Calif.: Bruce C. P. Rayner
18818 Teller Avenue, Suite 170 Irvine, Calif. 92715 (714) 851-9422

Northwest: Paula Doe
5011 133rd Place SE Bellevue, Wash. 98006 (206) 641-0903

Paris: Jack Gee
11, rue de Vaugirard, 75006, Paris, France 011-331-4 354-4200 Telex: 21 4235

PRODUCTION

VP Production: Wayne Hulitzky

Director of Production/Manufacturing: John R. Sanders

Production Supervisor: Bill Tomaselli

Production Manager: Betsy Harkins (617) 964-3030

CIRCULATION

Group Circulation Manager: Eric Schmierer
271 St. Paul Street, Denver, Colo. 80206 (303) 388-4511

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Dilemma for distributors

Let's have some sympathy — just a little — for industrial distributors. They're traditionally components kinds of guys, but they just don't seem to get it quite right when it comes to semiconductors. Ordering too much too early, they risk being stuck with shelves creaking with inventory. Too little and too late, and they lose market share by missing the best of the new sales cycle.

To try to escape the feeling that they're just popcorn in the chip-business popper, many of them are opting for what they think is less spicy, but just as nourishing fare: selling computers and computer products. But as our associate editor Bruce Rayner found out, that's no sure stomach-settler because Wall Street has begun asking: "Where's the beef in computer profits?" Tony Hamilton can argue that 20%-plus gross margins are attainable, but the financial types aren't convinced. Tony may have an even harder time supporting his decision to get into the value-added software business too.

There's more on the world of distribution, penned by the able hand of contributing editor Dwight Davis. Dwight found that electronics-industry distributors have been on a sales role lately, expecting revenue to climb 20% this year to give aggregate approaching $8.5 billion.

Associate editor Bruce Rayner

Europe 1992

U.S. electronics firms need to know how to deal with the proposed "United States of Europe," the single economic market idea that may in the end turn out to be little more than a pretty theory. And they need to know now if they're to have any chance of laying out marketing or manufacturing strategies there. Contributing editor Jack Gee explores some of the broader implications in the first of many articles we will run on this crucial topic.

SMT surprise

Makers of circuit-board CAD systems thought they had SMT all sewn up. But they didn't anticipate all the problems SMT would create, such as hot spots on boards. Read the story by our new assistant editor Tony Greene to learn how the CAD lads are coping.

JOHN KERR, managing editor

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BPA ABP

1992: Supplying electronics to 320 million Europeans

Europe is unifying its market. Some say that's great. Some say it ain't. Some even say it'll make no difference. But why is IBM so pleased?

In a recent government-sponsored commercial on French television, a frail-looking yuppie jumps up from his office desk and strips into boxing shorts. Then, he lunges at a formidable Japanese Sumo wrestler and a muscular American baseball player. It's an uneven match. But 11 other young men in shorts bearing the colors of the European Community (EC) come to the rescue. Together, the European dozen beat up the two outsiders.

That TV message is clear. And it deserves attention from American electronics companies. In 1992, the EC's hodgepodge of 12 national markets will merge into a single unit with 320 million consumers. The objective is to create a single marketplace in which physical, fiscal and technical barriers to trade will be dismantled. European countries will no longer be able to put up with protectionist barricades against products from their neighbors. But will this new Europe be an easier or tougher place for U.S., Japanese and other foreign competitors to do business?

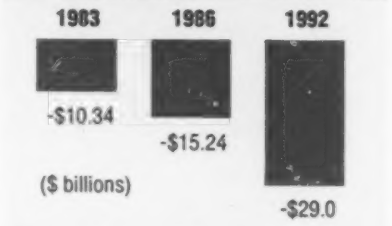
The jury is likely to remain out for some while. The optimists forecast that bigger, more powerful European companies will emerge in electronics and other industries. They say that U.S. and Japanese companies should also find it simpler and cheaper to manufacture and sell in Europe.

Robert R. Heikes, who has successively headed the European semiconductor operations of Motorola Inc. and National Semiconductor Corp., argues: "The U.S. firms can only do even better than now. They have been penetrating each European company with manufacturing, sales and marketing for 20 years. They are ready to attack Europe globally. The Europeans, long confined within their own national frontiers and markets, are not ready for this new challenge."

However, among Europe's industrialists and politicians, there is a strong drive to close ranks against competition from overseas. Robert Taylor, a consultant at European Research Associates in Brussels, Belgium, says: "The question is whether the EC will become Fortress Europe. Americans and Japanese have grounds to fear that Europe will become more difficult to penetrate. There are already signs that the protective barriers which European countries are about to dismantle between each other will be raised again as an EC barrier against outsiders."

Many European business leaders make no bones about their determination to make life more difficult for U.S. and Japanese electronics firms. Bernard Esambert, a banker who served at the top management level with France's flagship computer maker Groupe Bull, says: "We have to create a spirit of industrial nationalism in Europe." Esambert, now chairman of Paris-based Compagnie Financiere Edmond de Rothschild, adds: "Unless we introduce and apply a 'Buy European Act' we shall be a continent that is up for grabs."

Europe's worsening trade deficit in electronics



Europe includes non-EC countries such as Switzerland, Austria, Norway and Finland

Sources: Organization of Economic Cooperation and Development; private forecasters

Europe badly needs a stronger high-tech base. But will a united market provide it?

Norbert Bininda, a Siemens AG telecom executive, argues: "What Europe expects from the U.S. and Japan is more open public procurement practices. It would be very bad if Europe were alone in adopting free-trade measures." However, less than 10% of procurement by Europe's government agencies is put out to international competition. Telecommunications contracts are a traditional preserve for local industry — and likely to remain so.

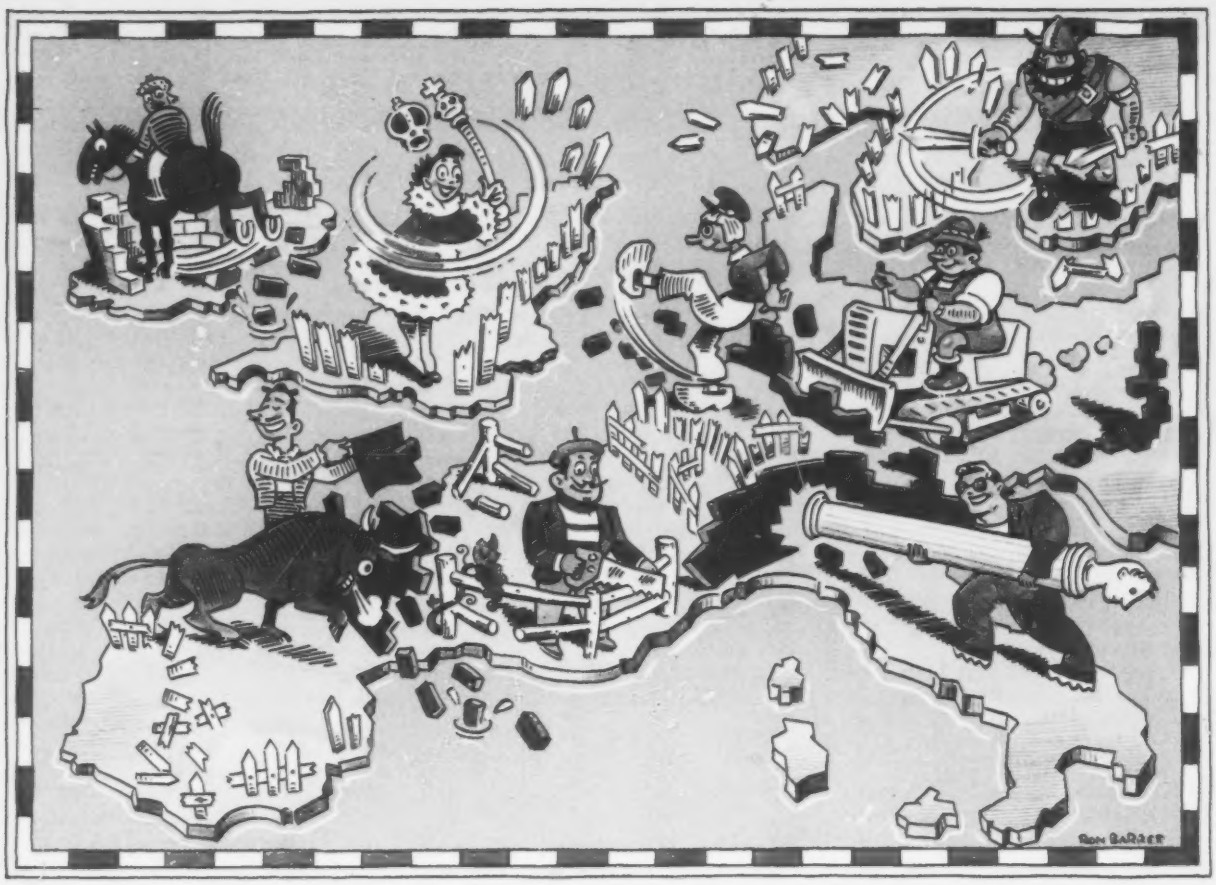
Depressing dependency

The French, whose electronics industry is still depressingly dependent on state funding, are particularly wary of laying down the EC welcome mat to all comers. "Not all the advantages that Europe is granting to its members will be made automatically available to other countries," warns Regis Astier, a senior official of the French Employers Association. "If Europe can't get at the U.S. public procurement market, they won't get at ours."

Henri Froment-Meurice, France's former ambassador to West Germany, says in a report prepared for his government on the outlook for 1992: "In telecommunications, the opening up of the European market is likely to benefit U.S. companies. We need negotiations to ensure reciprocity with the U.S. and Japan."

This suspicion of the United States and Japan reflects European concern about the immense amount of ground its electronics firms have to make up. Last year, the EC reckoned that its member countries were running a high-tech trade deficit of $10 billion. That compared with a surplus of $1.3 billion for the United States and $8.6 billion for Japan.

The Paris-based Organization of Economic Cooperation and Development (OECD) says that, including non-EC countries such as Switzerland, Austria, Norway and Finland,



Ron Barrett

Europe's electronics deficit rose from $10.34 billion in 1983 to $15.24 billion in 1986 and grew again last year. It is likely to reach a whopping $29 billion by 1992, according to private forecasters.

Concern in Europe about how it will perform if trade barriers with the outside world are pulled down is reflected by other grim statistics. Last year, local companies captured only 20% of their continental market for computers, peripherals and software. That is a smaller share than IBM's own chunk of the European market.

In semiconductors, European manufacturers carved out a 42% slice of the local market, but lost ground to their U.S. and Japanese rivals in other parts of the world, according to Dataquest Ltd., the London-based European arm of the San Jose market research firm.

It seems doubtful that the European manufacturers will be able to maintain even their current market shares in semiconductors. Their ability to create a genuine common market in this sector is being severely tested by wrangling between N.V. Philips GL, Plessey Company Plc, SGS-Thomson and Siemens, over an ambitious scheme to develop technologies for the microchips of the late 1990s.

Provisionally named Joint European Semiconductor Silicon (JESSI), the project can expect government and industrial funds of more than $2 billion, more than the $1.5 billion Sematech research venture by leading U.S. chip makers. If JESSI goes ahead, it would match efforts in Japan, where 10 times more scientists and engineers than in Europe are working on advanced semiconductor research.

It's doubtful that European firms will even maintain current market shares in chips

However, the European semiconductor companies are advancing in disarray. West Germany's Siemens and the Netherlands' Philips, which with their governments have provided the initial push for the project, say they do not want Britain's Plessey as a partner because it lacks international stature in the chip business. They are also reluctant to give SGS-Thomson more than a junior role. Hermann Franz, director of Siemen's semiconductor operations, says: "Philips and Siemens will develop the technology itself. SGS-Thomson could be associated with work on design and equipment." Philippe Geyres, director for strategic planning at SGS-Thomson, replies: "Such limited involvement is unacceptable to us."

In readiness for 1992, Europe's computer systems manufacturers are working together to develop joint standards. "These will help the semiconductor industry – U.S. and Japanese firms as well as the Europeans," says Bipin Parmar, a senior industry analyst at Dataquest, London. "Until now, personal computers have had to meet different safety regulations in each country. With unified standards, semiconductor firms can look forward to new prosperity because the 1992 landmark is going to mean bigger volumes."

Parmar does not expect Europe to adopt protectionist policies to exclude imported chips. He says: "This would damage Europe's computer business. Anyway, the U.S. already has well established plants in Europe and now the Japanese are moving in, too." The Dataquest analyst also predicts new mergers between European semiconductor firms, following those between France's Thomson Semicon-

ductor and Italy's SGS and Plessey's acquisition of Ferranti Plc's chip business in Britain. "Critical mass will become more and more vital," Parmar says.

In telecommunications, U.S. and Japanese manufacturers are preparing for the 1992 landmark by trying to beef up their European presence. Northern Telecom Inc. recently began investing $100 million in the development and manufacturing of private branch exchanges at a site near Verdun, France's World War I battle field. AT&T, disappointed by poor sales of its central office switches by Philips, is trying to spice up its business by allying with other European telecom firms.

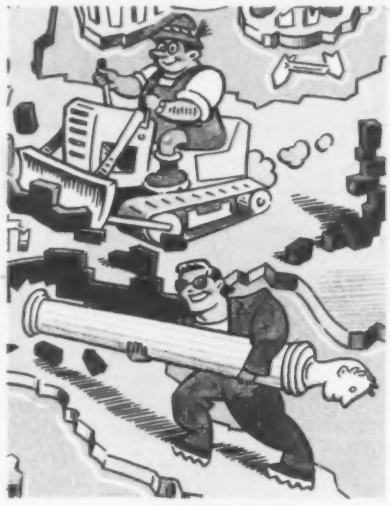
Signs are absent that Britain, the only European country to deregulate its carrier services, will be followed by its neighbors. But there is a trend to ease controls on sales of telephones, computer modems and other communications gear. Until now, these have been under the control of government-managed carriers and telecom authorities. With electronic mail, the fast-growing markets for office phone equipment are worth $8.5 million a year in Europe. However, the timid moves toward liberalization will leave untouched the rest of the $90 million a year telecom European market, including the $60 million basic phone service, a sacred cash cow for governments. In West Germany, the state-owned Bundespost's monopoly over most communication services is contributing $2.7 billion to the national treasury.

Ted Richardson, director of Dataquest's European Telecommunications Industry Service, says: "American and Japanese telecom firms will find themselves under increasing pressure to manufacture in Europe. There's a real danger that, if they don't, they will find that, as the internal European barriers come down, the external ones will be raised higher. EC has made telecom a strategic industry for Europe that it intends to defend."

U.S. companies which are selling but not yet marketing in Europe are looking at the implications of 1992. At CalComp, a manufacturer of computer graphics products which is based in Anaheim, Calif., president William P. Conlin says: "By that date we could be close to capacity in our U.S. plants. That could be the time to turn to manufacturing overseas, particularly in Europe. We are already having difficulties shipping product across the Atlantic. A European plant could be the solution to a number of problems."

IBM relishes 1992

IBM is looking forward to 1992. "We see that date as an opportunity for strengthening Europe's competitiveness," says C. Michael Armstrong, chief executive of IBM-Europe, which is based in Paris. IBM has founded its manufacturing strategy on making a different product at each of its 15 European plants. Personal computers turned out at Greenock, Scotland, mainframes from Montpellier, France, and megabit memory chips made at Sindelfingen, Germany, are shipped to customers around the continent. Big Blue can look forward to saving money when the barriers at Europe's national borders are demolished, sales taxes harmonized and technical standards unified.



Many European companies are clearly worried about the implications of increased competition from their neighbors and from the United States and Japan. "That's sheer weakness of will," comments Alain Minc, head of Cerus, the French holding company of Italian industrialist Carlo de Benedetti, whose empire includes computer maker Olivetti Corp. The payroll of Europe's leading cross-border merger artist now includes as many foreigners as Italians. The newcomers do not have to learn the language because top-level meetings are now conducted in English.

Andre Delage, a director general at Compagnie Generale d'Electricite, the French company which last year merged the telecommunications business of ITT into Alcatel NV, says: "The existing trade barriers are important. But we have stressed them too much as grounds for doing nothing."

Philips is already overhauling a European marketing and manufacturing organization which, until now, has been closely geared to serving its local subsidiaries. These have traditionally made and sold product for the countries in which they are based. But, in rationalizing its operations in Europe, the Dutch multinational is being careful not to upset its customers. For example, Andre Mercier, chairman of La Radiotechnique, Philips' French offshoot, says: "We have carefully cultivated our image as a French company. This is vital for doing business, particularly when bidding for government contracts."

Siemens admits that the challenge of the new European market is posing major problems. "Government attitudes and institutional structures won't change," says Herbert Stich, executive director for sales and marketing at the West German electronics giant. "We will still be thinking in terms of working on the Spanish or Italian markets, not a single European market."

For Xavier de Montfalcon, planning director of Merlin-Gerin, a French maker of electronics and electrical equipment, the priority for suppliers is to understand the ingrained habits of customers in each EC country. "Habits are something you cannot pass laws about," he says.

Europe lags behind the United States and Japan in almost the entire range of electronics products. By 1995, computing and communications are likely to represent 12% of the Old Continent's economic activity, compared with 4% today.

Europe, therefore, faces a decisive choice. One option is to develop a high-tech industrial base which can rival those of the Untied States and Japan. The other, which it would prefer to avoid as much as its rivals, is a dangerous trade war with Washington and Tokyo.

JACK GEE

Smart manufacturers still betting on smart power

It will be a few years before smart power IC sales pass $1 billion. But business is now taking off

Two years ago, the silicon marriage of logic control and power switching — known as smart power — looked like the second coming of the transistor. Wherever electric signals were translated into mechanical motion represented a market for these advanced products. In replacing many discrete components, smart power semiconductors would significantly reduce production costs, power consumption and component failures and, as a result, it was believed, create an instant billion dollar market.

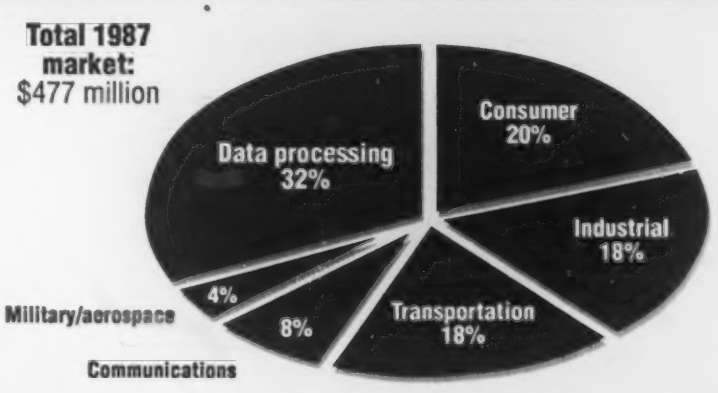
Although expectations have been tempered since then, the market passed through an important threshold last year. Sales were high enough to attract new entrants while established smart power semiconductor makers worked on new applications and profited from existing ones. Unfortunately, because high development costs, technical hurdles, reduced profitability for dedicated applications and formidable existing technology slowed growth somewhat, it will be a few years before smart power chips reach $1 billion in annual sales.

But manufacturers aren't complaining. European and North American suppliers last year shipped smart power products worth $477 million, according to Dataquest, a San Jose market researcher. Leading the pack with $150 million in sales was SGS-Thomson, which shipped its half-billionth audio smart power device in 1987, according to Ian Wilson, marketing manager for SGS-Thomson's power and analog group based in Phoenix. "We are very bullish," says Wilson. "The market is a long way from maturity."

By 1992, the market for smart power devices (greater than 1 amp or 100 volts) will triple to $1.13 billion, according to Dataquest. Another research company, Electronic Trend Publications (ETP) of Saratoga, Calif., is just as optimistic, pegging the 1992 market at $1.45 billion, or 20% of total power supply sales that year. And by 1995, fully one-third of the projected $7.4 billion power supply market will be smart power, as the world heads toward electromechanical obsolescence, ETP reports.

SGS-Thomson and competitors such as Cherry Semiconductor Corp., Motorola Inc. and Sprague Technologies Inc. see smart power moving in two directions in the future. The hottest development area is high-load and/or high-voltage smart power chips — to 1,000 volts and 100 amps — for controlling AC induction motors, telecom relay switches, and electroluminescent computer displays. Today, these types of chips are scarce and not cost effective. However, Siliconix Inc. of Santa Clara, Calif., recently introduced a chip capable of controlling small industrial motors, solenoids and lamp switches.

Applications for smart power devices — 1987



Source: Dataquest Inc.

Multiplexing on its way

Multiplexing is another major development. Theoretically, multiplexed smart power chips would allow a single wire to control and monitor all the electrical systems in a commercial jetliner. Hundreds of smart power chips connected to centralized microprocessors would regulate electrical output to devices in the farthest reaches of an airplane.

The economics are compelling. A single wire would eliminate hundreds of dedicated wires — reducing the cost of manufacturing and the plane's weight and increasing reliability.

More realistic is partial multiplexing, whereby five wires and low-voltage, high-current smart power chips would replace the usual 30 wires controlling various devices in an automobile door. SGS-Thomson, says Wilson, is working on such products.

For now, the action in smart power resides in relatively low- and medium-power chips, which range from 1 amp and a few volts, up to 150 volts and 30 amps. Last year, the largest single market was data processing, including computer peripherals such as disk drives and printers. Ronald A. Bohn, a Dataquest analyst, pegged 1987 demand at $152.3 million. Motorola, with $114 million in smart power sales last year, has focused on up to 150-volt products for the consumer and automotive markets, according to Dan Artusi, director for marketing for power transistors in the company's semiconductor products sector. Motorola's chips are used in camcorders, cameras, compact disc players and other battery-powered consumer goods for which miniaturization is important. "You can integrate a lot into one package," says Artusi, adding that smart power puts less drain on precious battery

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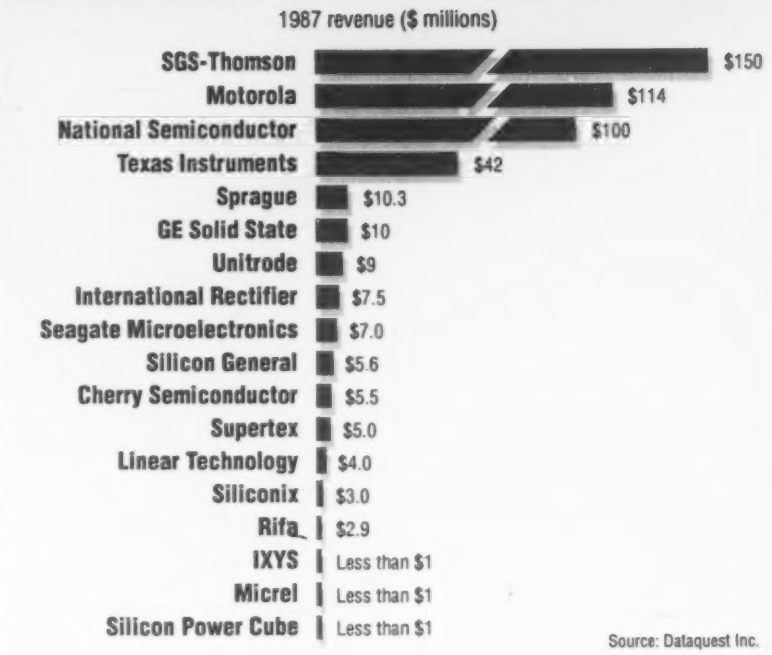
Top smart power IC makers



Source: Dataquest Inc.

power than numerous discrete components.

Sprague Technologies' semiconductor group in Worcester, Mass., ranked fifth in the Dataquest survey, ringing up $10.3 million in sales in 1987. "We play in the under 10-amp, under 400-volt market, [selling to computer peripheral manufacturers and automakers]," notes Bob Frostholm, Sprague vice president for strategic marketing for chips. Sprague is believed to be developing multiplexed products.

As the market moves into the higher load arena, cost will likely separate the winners from the losers. "Either you have to be a very small niche supplier or one of the big guys," says SGS-Thomson's Wilson. The "small" suppliers include new companies such as IXYS Corp., Micrel Semiconductor Inc., Power Integration Inc. and Silicon Power Cube Corp. These companies are pushing the development envelope with new technologies and breaking into the high-voltage, high-current marketplace, according to Bohn. Both IXYS and Micrel, for example, have made advances in combining DMOS and CMOS, Dataquest reports.

In 1987, the smart power technology was predominantly bipolar, representing $336 million in sales. The first smart chip was developed in 1977 by Sprague when CMOS logic was combined with the power bipolar process. But entry into higher power markets will force further merging of bipolar and MOS technologies as well as development of completely nonbipolar technology. By 1992, bipolar will drop to less than half the market of these competing technologies. Among them are: CMOS plus DMOS; BiMOS; bipolar I^2 logic; and BiMOS plus DMOS technologies.

"DMOS is a great technology, but it puts you at tremendous cost disadvantage," notes Sprague's Frostholm. Issues that must be resolved include the need for: better yields; more cost effective packaging; improved technological benefits; and more standards. Developing the new technologies will require heavy capital spending and possible partnerships or, at least, order commitments from major customers such as automakers, Bohn observes. And maybe in a year or two, the initial euphoria will have been justified.

JOHN M. DODGE

Avnet's Tony Hamilton and the rest say they can make 25%-plus on computer sales. Critics claim they'll be lucky to clear 10% — and to escape bitter channel conflict

Why distributors may be wrong to sell computers

BY BRUCE C.P. RAYNER

This summer, top-ranked electronics distributor Hamilton/Avnet, a division of New York-based Avnet Inc., quietly split itself into two separate business units: one division now directs its sales efforts toward the traditional electronic component business, while the other focuses exclusively on selling computer products and systems. The goal for the newly formed computer division is $400 million in annual revenue by July 1989, and over $1 billion by the early 1990s. If realized, this will put Hamilton/Avnet at well over $2 billion in annual sales in a few years.

Earlier in the year, fourth-ranked Hall-Mark Electronics Corp., a Dallas-based distributor, inked a $3 million three-year deal with software vendor MCBA Inc. to market Unix application packages. The move is a significant departure by an industrial distributor into the uncharted waters of combined software-hardware solutions sales. Hall-Mark now acts as a systems integrator by selling the MCBA software in conjunction with Unisys Corp. computer systems. In total, the distributor hopes for $500 million in computer systems revenue by 1991.

Other industrial distributors are hot on the heels of both Hall-Mark and Hamilton/Avnet for a piece of the burgeoning computer systems market. Arrow Electronics Inc. now has three computer products divisions, two from its Ducommun acquisition; British-owned Lex Electronics Inc. sells systems through two U.S. divisions; Wyle Laboratories' Electronics Marketing Group is growing its market share in the western United States; and others are entering the fray by reselling anything from board-level products to complete turnkey solutions.

The push into the computer business by distributors has far-reaching consequences for all companies associated with computer products. For computer and software vendors, it means tapping a powerful source through which new markets can be reached; for the 8,000 to 9,000 value-added resellers and distributors (VARs and VADs) in the United States, it means being forced to develop new relationships and possibly facing new competition; and for the end user it means another option in purchasing equipment.

But the new relationships between computer-systems vendors and in-

Mark Richards/Picture Group

What, me worry? Doyen of distribution, Tony Hamilton: "Good distributors should make in the area of 25%-plus gross profit as we get into 1989 . . ."

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dustrial distributors are fraught with risk. While sales growth may not be in question, profitability certainly is. And channel conflict, where distributors may end up warring with VARs or with direct salespeople, becomes a very real issue. The scenario also blurs the distinctions between computer-only distributors, industrial distributors and "master" VARs.

However, the industrial distributors contend there is plenty of business for them to peacefully coexist with both vendors and other computer resellers. The total available U.S. computer products market is estimated to be worth over $140 billion, sources say. In 1987, the distributors' share of that was still an insignificant $2 billion. However, that $2 billion accounts for close to 30% of total distribution sales and has been growing at close to 40% a year for the past five years. By all accounts, that growth rate is expected to continue.

"The [computer systems] market itself is moving towards two-tiered distribution because the manufacturers are realizing they can't afford to sell to the little VARs," says Steven Bosley, director of the value-added distribution planning service at International Data Corp. in Framingham, Mass. Cases in point are Digital Equipment Corp., NCR Corp. and Unisys, all of which have devised strategies that cut small VARs out of their direct sales loop and give them to distributors (see box).

"Those distributors that are well financed and well managed and have the right perspective will seize opportunities if they can be of service to the supplier and the customer," says Anthony Hamilton, president of Hamilton/Avnet and chairman of parent Avnet. Hamilton should know what he is talking about. Hamilton/Avnet's long-standing relationship with DEC is paving the way for the distributor to do an estimated $500 million in computer sales in fiscal year 1990, ending in June 1991. Hamilton says his company is on track for that target.

DEC's lead

DEC is banking on the success of industrial distributors to penetrate the systems business. For the last 10 years, DEC has relied on distributors like Hamilton/Avnet to supply the end user with board-level products and peripherals. But more recently, the No. 2 computer vendor has expanded its distributors' involvement to include all its systems products except mainframes. And in March of last year, Digital formalized a policy whereby all its VARs that do less than $500,000 annually must deal through distributors.

Part of the reason for the move was because of the changing nature of distribution. Says John O'Keefe, manager of the Indirect Channels Group at Digital: "As we have gotten better at delivering product quickly — now, almost all our products can be turned around in 24 hours — the dependence on a distributor who typically inventoried and then responded quickly is diminishing." That leads distributors into new markets, he adds, including selling value-added hardware systems to VARs and end users.

In all, DEC sells through five industrial distributors: Arrow Electronics' MTI division, GTE Data Products, Hamilton/Avnet, Pioneer-Standard Electronics Inc. and Wyle Labs. Sources estimate that Hamilton/Avnet accounts for over 50% of the total DEC business, while Pioneer-Standard and Wyle together make up close to 40%. DEC does not release figures for its total systems distribution business, but sources put the 1987 total at $360 million.

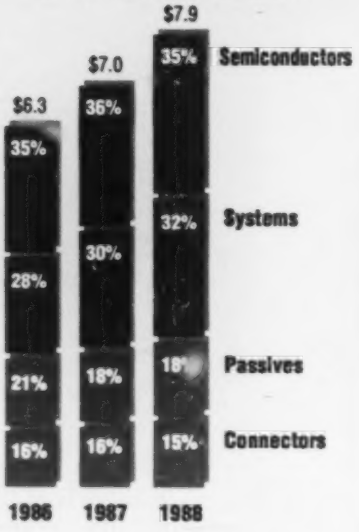
The growth projections of Digital's business with Wyle are "excellent," says James Hunt, vice president for computer products at Wyle. He expects annual growth on the order of 50% in 1988 and 1989. Since 1986, his DEC sales have risen from $20 million to $50 million, says Hunt.

Even though most distributors are publicly upbeat about DEC's year-old policy, some are less than sanguine about results to date. Preston Heller, chairman of Pioneer-Standard, says that since the change, revenue from DEC equipment has not been as material as first believed.

The comments from small VARs prove Heller's point. "I think everyone is taking a look at what DEC did and I think they think that DEC shot themselves in the foot," says a disgruntled Russel Nutter, president of Business Oriented Support Systems Inc., a $2 million a year VAR whose Harper Woods, Mich., business now

Total sales by distributors

By major segment ($ billions)

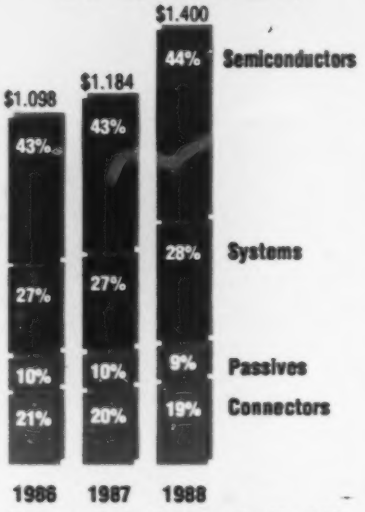


Source: Bear Stearns & Co.

Distributors post steady growth in computer systems sales

Avnet's distribution sales

Sales by segment of Avnet's Electronic Marketing Group ($ billions)



Figures are for fiscal years ending March 31

Source: Avnet Inc.

About 75% of Electronic Marketing Group's sales come from Hamilton/Avnet

According to William Page, executive vice president and head of Hamilton/Avnet's new computer division, margins are currently running slightly above 20%

has to deal through Hamilton/Avnet instead of direct to DEC. "My opinion is that they [DEC] are losing some of the volume from the VAR channel," he adds.

"I would certainly expect some [VARs] to be confused," concedes Digital's O'Keefe, but he is adamant that if they are not getting satisfactory service from their new distributors, all they need do is contact him and he will straighten it out. "We are absolutely committed to getting those VARs the same level of support," he says.

Dissatisfied VARs

But there are other issues besides dissatisfied VARs that Digital and its distributors must face. The initial optimism may have been ill-founded because of the longer sell cycle and the more attention that the customer demands in computer products as opposed to components, comments Paul Zorfass, director of computing research at Boston-based The Yankee Group. This puts pressure on total sales figures as well as profit margins.

Master VARs — big national VARS that sell to smaller local and regional VARs — and other systems resellers operate on thinner profit margins than industrial distributors. Clarke Walser, an analyst at investment brokerage Chicago Corp., is concerned that profit margins in computer systems distribution are not high enough to sustaininvestments in value-added services.

Historically, margins in computer distribution have run from below 10% to the mid-teens, while industrial distributors are accustomed to returns on sales of at least 20%. "I get the sense that distributors are saying to themselves that there is a large number of dollars out there and we need to get a piece of it," says Walser. "But their cost might be too high," he adds.

Other Wall Street observers are equally doubtful about the long-term profitability of distributors selling computer systems. Elizabeth Dorsey, a Prudential-Bache Securities Inc. analyst in New York City, points to figures that show some distributors' gross margins for commercial computer products dropping below 10%. She speculates that distributors stepped up their involvement in the computer business in the past few years partly because of lackluster component sales in the 1985-1986 downturn. Computer systems provide a counter-cyclical offset to component sales, she says.

In 1987, distributors' share of the $140 billion U.S. computer market was $2 billion

But Hamilton insists that margins in computer sales are holding their own. "It would appear that good distributors should make in the area of 25%-plus gross profit as we get into 1989 in the computer business," he says. According to William Page, executive vice president and head of Hamilton/Avnet's new computer division, margins are currently running slightly above 20%. Other distributors report slightly lower margins, especially when selling to VARs.

According to Zorfass, Digital's long-term distribution strategy is in for trouble for other reasons. He claims that DEC's business systems sales through distribution will be hit hard by the new IBM AS/400 midrange computer. Zorfass thinks that to get that product to market, IBM will target the third-party channels such as VARs and systems integrators. "We expect to see IBM becoming more active in aggressive distribution channels with both their PS/2 line and the AS/400," he says. Zorfass has seen "early indications" that traditional OEMs and VARs of DEC's VAX commercial systems are starting to look at the AS/400.

Others point to growth in the Unix business as a reason for less than record-breaking growth in distributor business for Digital. Despite the recent Open Systems Foundation (OSF) agreement between IBM, DEC and others, which promises a Unix standard across several vendors' machines, some resellers are hedging their bets. A few of Digital's competitors are claiming their business is benefiting from the confusion.

"Some of the larger VARs are being driven away from DEC and IBM; they're saying they are not going to be locked in," comments NCR's Ernest DeVane, assistant vice president in the OEM systems division. DEC's O'Keefe has a different opinion about OSF: "I actually thing it is going to help," he says, "it supports our commitment to Unix." Just when that commitment will materialize is uncertain.

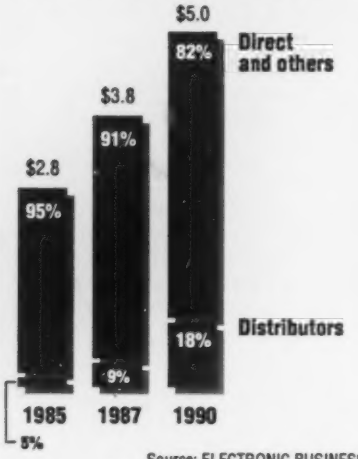
Channel conflict

Distribution problems are bound to arise when channels change. Overdistribution and price wars are common in industrial distribution and the ever-present fear of channel conflict — loosely defined as more than one party trying to sell the same equipment to one buyer — can wreak havoc in any sales organization. And as DEC may just now be finding out,

Mark Richards/Picture Group

DEC's distribution sales

DEC's sales through distribution channels, U.S. calendar year shipments ($ billions)

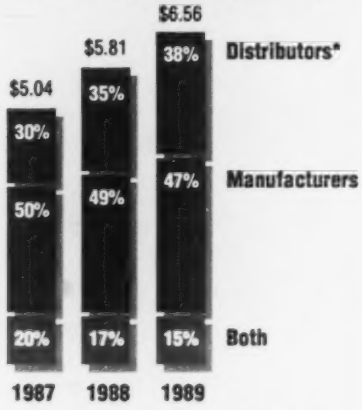


Source: ELECTRONIC BUSINESS and Smith Barney, Harris Upham & Co.

Some vendors are increasing the share of business they do with distributors...

VAR computer purchases

Survey results of where VARs buy their primary processors ($ billions)



* Distributors include all suppliers other than manufacturers

Source: International Data Corp.

...while VARS are turning to distributors for more of their computer purchases

loyalty to a vendor is sometimes strained when smaller VARs get palmed off to distributors.

It does not stop there. In the world of the middleman, industrial distributors are not the only ones vying for a piece of the pie. "The systems distributors are broadening their product line to include some of the things that the industrial distributors have and some of the industrial distributors are moving into the systems distribution line," comments Jerry Martin, president of First Computer Corp., a $10 million computer distributor in Burr Ridge, Ill.

"The key in any conflict, be it between direct salesforce and distributors or VARs or resellers or whatever, has a lot to do with two items: one of which is definition of responsibility and the other is compensation," comments Jack MacDougall, director of worldwide reseller programs at Prime Computer Inc. As long as the direct salespeople know their territory and are paid enough to pass unwanted sales leads on to distributors or VARs, then all should be well.

One vendor that is serious about minimizing channel conflict is Texas Instruments Inc. According to some VARs, TI's commitment to avoiding channel conflict is held in high regard. The vendor does not allow any of its distributors to deal directly with the end user, and all VARs are contracted to add value of at least 30% to the system they sell. Also, TI's direct salespeople are paid 150% commission (that is, one-and-a-half times what they would make if they sold direct) to do referrals of second-tier VARs and distributors, says Wendel Harrison, the marketing manager at TI's Computer Systems Division.

Now that distributors have the green light from DEC to sell into the end-user market, the potential for distributor-to-distributor and distributor-to-VAR channel conflict could increase. Pioneer-Standard's Heller calls the end-user market "an explosive possibility" but insists that

A sampling of third-party distribution systems

Different computer vendors have different ways of dealing with distributors. Some, like Digital Equipment Corp., have a long-standing relationship with industrial distributors, while others, such as Hewlett-Packard Co., prefer to have nothing to do with them. Here is a sample of some vendors' third-party distribution systems:

- **Altos Computer Systems** does not have a direct salesforce. Instead, it deals either directly or indirectly with over 1,000 value added resellers (VARs), as well as with five regional and two national distributors. The two nationals are Arrow Electronics Inc. and MicroAmerica Inc. Over 50% of U.S. sales come from distribution. Altos' goal is to build the distribution network up to between eight and 10 distributors in total.
- **AT&T** employs seven value-added systems distributors including Ducommun Data Systems, a division of Arrow Electronics Inc., to distribute its Unix-based minicomputers. It also uses Master VARs that can sell either direct to the end user or through VARs. To avoid channel conflict there are very rigid limits on how a VAR can deal with a distributor or Master VAR.
- **Hewlett-Packard Co.** sells its technical and business computer systems either directly or indirectly through VARs. There are no plans at this time to add any distributors to the third-party salesforce, but "eventually it could include some distributors," says a spokesperson.
- **Data General Corp.** is in the process of reworking its strategy on all channels, says John McGlone, director for channel marketing at Data General. The resulting structure could include distributors, but McGlone is noncommital. Currently, about 50% of all sales go through VARs.
- **Digital Equipment Corp.** has a number of channels, both direct and indirect, including a growing relationship with industrial distributors. In March of 1987, a $500,000 lower limit was placed on VARs that could deal directly with DEC; all others now must go through distributors. The primary distributors DEC uses are Hamilton/Avnet, Arrow Electronics, Lex Electronics, Pioneer-Standard, GTE Data Products and Wyle Laboratories.
- **NCR Corp.** sells to OEMs, VARs, master VARs and through distribution. The VARs have to sell at least $400,000 a year, or else they must buy through distributors.

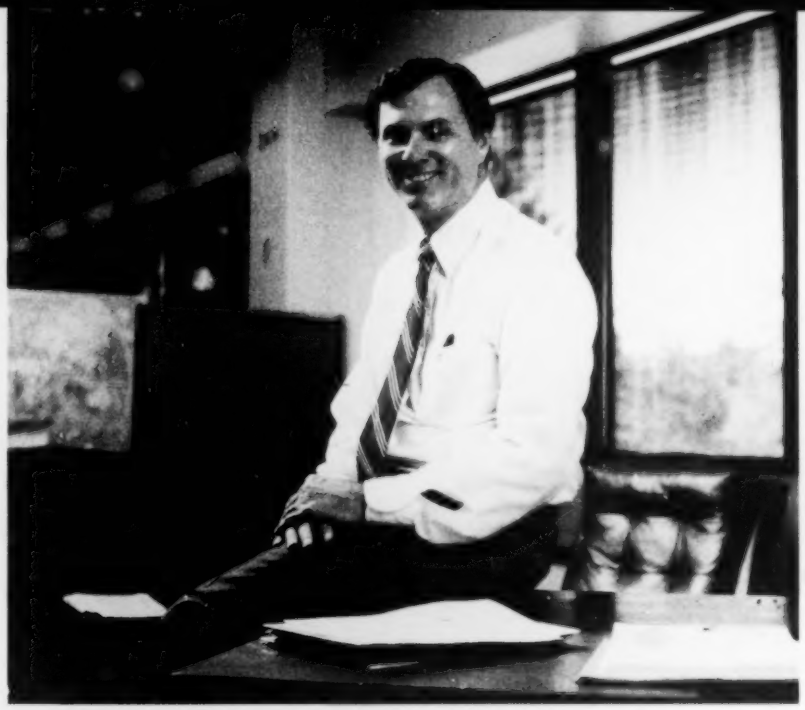
there is no overlap between VARs and distributors. The company currently expects systems sales to provide over 30% of the $425 million in sales it anticipates for this year.

Typically, says Heller, VARs have well-defined vertical markets that require a significant amount of value added, usually in terms of software support. This is not the main market targeted by distributors. However, Pioneer-Standard is developing relationships with software houses that would enable the company to penetrate vertical markets.

Hamilton/Avnet's Page is equally reticent to admit any conflict with VARs. He insists that it is not company policy to get into the applications software writing business. But Hamilton/Avnet is developing partnerships with software companies at this time that, like Pioneer-Standard and Hall-Mark, could mean a new vertical focus for the company. "We do know that selling together with software experts has value and we expect to do more and more," says Page.

Channel conflict could also be a problem between Digital's own salespeople and distributors, says Bosley at IDC, as Digital puts more emphasis on selling jointly with systems cooperative marketing program (SCMP) participants, a fancy acronym for big resellers that sell applications with DEC's salesforce. "The success of those programs will in effect take business away from distributors," Bosley says.

Digital's O'Keefe refutes the claim that distributors will suffer. "You want to be careful you don't overdistribute," he says, "but we are nowhere near that right now." Overdistribution and competition based on price alone is a certain formula for disaster, and most vendors are sensitive to the need to maintain prices. According to O'Keefe, there are two ways to avoid plummeting street prices: first, make sure distributors compete on more than just price (i.e. value added); and second, do not offer extensive discounts. O'Keefe insists Digital does both: "Our street price has been real solid over the last three to four years," he says. □



Dilip Chauhan

Gimme distributors that can add value. Says DEC's John O'Keefe, "Dependence on a distributor who typically only inventoried and then responded quickly is diminishing"

NCR has four regional distributors and one national distributor that sell its Tower computer family, terminals and some printers, says Ernest DeVane, assistant vice president at the OEM systems division at NCR. Distributors can sell either to the end user or through VARs as they choose.

• **Prime Computer Inc.'s** mature 50 Series and the new EXL Unix microcomputer are both sold by the in-house salesforce as well as indirectly through Master VARs and VARs. The EXL's Master VAR program is just getting under way and will include about 12 participants by the end of this month, says Jack MacDougall, director of worldwide reseller programs at Prime. None of those Master VARs will be allowed to sell directly to the end market. As for distributors, Prime does not deal with any at present, but if a low-end system is marketed, then the vendor could be on the lookout, says MacDougall.

• **Texas Instruments Inc.** does not deal with any industrial distributors, but does sell through six 100% computer distributors and over 300 VARs. Direct VARs must do at least $500,000 annually in systems sales and add 30% of the value to the end user in order to qualify for direct service from TI. Distributors must do $1 million and cannot sell directly to the end user. The distribution program was introduced in May of 1987 for the new System 1000 and augments the distribution system in place of the older 990 business system, says Wendel Harrison, division marketing manager for the Computer Systems Group at TI. He does not rule out future use of distributors.

• **Tandem Computers Inc.** is a niche-oriented vendor in the fault-tolerant and on-line transaction processing business; it does not currently use distributors. Its channels include direct sales, VARS, systems integrators and Master VARs. Tandem views distributors as too commodity-oriented for its product offerings. However, the company has recently been contacted by two large undisclosed national distributors and is currently evaluating that channel, says Robert Cronin, manager of reseller marketing programs at Tandem.

• **Unisys Corp.** has been revamping its third-party distribution system since the merger of Sperry and Burroughs last year. As a result, the number of distributors has dropped from about 50 to seven, but that number could grow to 10. National distributors must do a minimum of $8 million in annual business, while Master VARs are required to do over $3 million. Dallas-based Hall-Mark Electronics is both a Master VAR and a distributor. Unisys is in the process of evaluating other distributors. □

Distributors need to be all they can be — for the Army

And for the Navy and Air Force, too. Sweeping changes in procurement policy may mean more military business for industrial distributors

BY BRUCE C.P. RAYNER

In November 1986, Robert Costello, the newly appointed assistant secretary of defense for production and logistics, paid a visit to the Defense Electronics Supply Center (DESC) in Dayton, Ohio, and gave the top brass a glimpse of the procurement shakeup to come. Costello, since named undersecretary of defense for acquisition, has now been given the go-ahead to put his ideas into action.

Two years after that first visit, DESC — the electronics spare parts supplier to America's armed forces — is starting to implement some of Costello's recommendations. It is a slow process, as is everything bureaucratic, but progress is being made. Major changes include two pilot programs that focus on reducing inventory, steamlining the procurement process and improving quality.

These changes have particular relevance to electronics distributors, as they account for over 70% of the orders for the 960,000-plus electronic components that DESC manages every year. In dollar terms, that translates into about $300 million, or about 50% of the estimated $615 million in purchases for the current fiscal year.

Because some products only have single sources, DESC is constantly scouting for new suppliers — particularly those that can ship high-quality products, complete with all mil-spec paperwork, direct to an Air Force base, an Army outpost, or a Navy cruiser in need of parts. "We are looking to do business with as broad a base as we can," commented DESC's commanding officer, Marine Corps Brig. Gen. Richard Huckaby, before his transfer in June. Fellow Marine Brig. Gen. Robert Tiebout succeeded Huckaby at DESC.

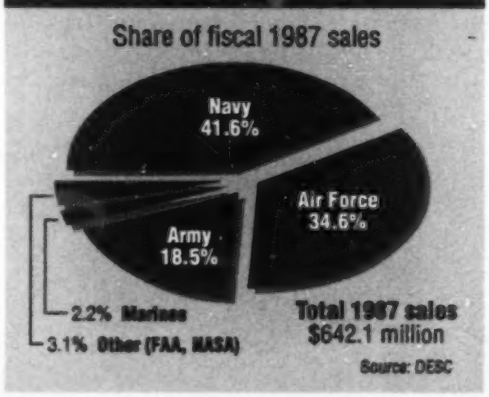
In the past, DESC has done plenty of buying from small business, including distributors. In fiscal 1987, DESC awarded $312 million to small businesses; and $20 million to companies with special considerations, such as being owned by the disadvantaged or by women; out of a total outlay of $642 million. And with the new DOD goal, that 5% of all procurement contracts over $25,000 be awarded to minority businesses, some small minority-owned distributors will benefit. DESC claims that with the new programs, small business will continue to do well.

To a degree, this has been the case, but there is some speculation that for distributor business, it will be the large distributors who will be the long-term winners. In theory, all contracts under $25,000 are set aside for small businesses, but in actuality there are several reasons for DESC's buyers to bypass this requirement — for instance, if the small supplier is not price competitive, or there is only a single source for a particular component.

DESC buys components from...

	Number of orders	Percentage of total DESC expenditures for the year
Distributors	70% - 80%	50%
Others	20% - 30%	50%

... and sells them to:



Paperless ordering

DESC is one of 33 original participants in Costello's pilot contracting activity program (PCAP) to overhaul the procurement system. Besides a number of regulatory changes under PCAP, two additional programs have been put in place that are designed to improve efficiency: the quality vendor program (QVP) and the paperless ordering placement systems (POPS). The QVP allows DESC's buyers to evaluate suppliers in terms of more than just price, while POPS lets the supplier bypass the DESC warehouse and ship directly to the customer.

Although both programs are still in their infancy, DESC claims they will produce significant change. Ideally, it's the integration of these programs into a synergistic procurement policy that will bring the biggest gains. "The quality vendor program allows us to buy with confidence," says Huckaby, "and if we happen to have a paperless ordering agreement with the quality vendor, then we can achieve our goal." The goal is to continually reduce inventory while insuring timely service to the more than 22,000 DESC customers.

Saving taxpayers' dollars is also a

consideration in these times of shrinking defense spending. To this end, DESC is cutting its inventory and consolidating part numbers in an attempt to streamline. For instance, in microcircuits, which include DRAMs and microprocessors, DESC has reduced its purchases by $6 million for the first nine months of fiscal 1988, compared with the same period in 1987, from $27.54 million to $21.68 million. While POPS and QVP are expected to cut costs, neither program is far enough along to have produced hard numbers on the savings to date. However, DESC estimates that POPS will shave 12% off the unit price of the electronic components that the services buy.

As of December 1987, when the program began, five POPS contracts have been awarded to OEMs for a total value of $370,000. Two of these have gone to small businesses for a total value of $207,000. "We are able to reduce the levels in our warehouses to bare minimum levels because the [vendor] is acting as our warehouse facility and we are using his already in-place distribution system," says Robert Knapp, a procurement analyst in the procurement systems office at DESC. The POPS program is designed for short delivery time components with simple test procedures and consistent demand patterns.

Dawson Jones

DESC procurement analyst Eleanor Holland: In pursuit of vendors — including distributors — that can deliver high quality on time

Anyone can play

Besides the five OEMs, DESC is considering 16 other vendors for POPS, seven or eight of which are distributors, says Knapp. These include Avnet Inc.'s Hamilton/Avnet operation, the top-ranked U.S. electronics distributor, and Marshall Industries, another big-league national distributor. Knapp stresses that any distributor, big or small, has the ability to participate in POPS under the DOD's Competition in Contracting Act, but those with a proven DESC track record have the upper hand.

The quality vendor program was set up late last year and allows DESC buyers to make decisions based on quality and speed of delivery as well as price in awarding contracts. "What we are looking for now is the overall performance of the vendor," says Eleanor Holland, a procurement analyst in the procurement policy office at DESC.

If a vendor qualifies for the QVP, it can receive as much as 20% over the price offered by the non-QVP vendor's price (This suggests the cost of poor quality in the past could have been greater than 20%.) To qualify, the vendor must have delivered three contracts totaling $10,000 worth of product in the last year; it must have a 90% on-time delivery record; and it must have kept quality problems within strict limits.

As of this summer, the pilot QVP has signed up 21 suppliers to participate in four product classes and is working on another five classes. "The value of the program is manufacturing-driven," says Holland, "but the delivery is important, so distributors have a place in the program too." Of the 21 participants, about 12 are distributors, including big-league players Bell Industries Inc., Hamilton/Avnet, Marshall Industries and Schweber Electronics, a division of Lex Electronics Inc. The first two contract awards under the QVP program were made in June to Hamilton/Avnet, and they were munificent sums indeed: a total of just $772.03 for digital microcircuits.

It's worth it to many to be QVP-qualified. Says Ron Moore, general manager at Bell Industries' Dayton, Ohio, military facility, the cost of not being on the program resulted in $50,000 in lost business for a two-month period. Bell came on board with the QVP in June. As a result, Moore anticipates that Bell's market share of DESC business will now increase. But he adds that because of the decline in total DESC purchases, it could mean a lower total dollar volume.

The next stage in the QVP is to expand into other product classes, with the intention of using the program as an incentive to get other suppliers to shape up. "We think that the vendors that are just beyond our criteria will start tightening their belts," says Holland. "Eventually, [QVP] will cover everything we buy," says Holland.

Even though QVP is open to all suppliers, Don Parham, director of military marketing at Schweber, believes that the program will eventually weed out the less proficient distributors, many of these being small firms. Because of the cost of supplying high quality military stock, there is the potential for DESC to consolidate its buying into the hands of a few well-financed national distributors. □

Distributors are back on track after two-year slump

Led by a booming semiconductor demand, electronics distributors' sales are climbing. But a market consolidation could hurt the smaller players

BY DWIGHT B. DAVIS

After two years of being battered by the mid-80s electronics industry slump, industrial distributors struggled back to their feet in 1987. The year finished strongly despite a weak start, with distributor sales surpassing the $7 billion mark for the first time. The recovery has continued this year — thanks in large part to the booming semiconductor sector — and most distributors expect the resurgence to stretch well into 1989.

Based on estimates that the semiconductor industry will grow 25% to 30% during 1988, Prudential-Bache Securities Inc. predicts that distributors will experience a 20% revenue surge this year, up to a total of $8.4 billion. Wall Street's Bear Stearns & Co. is a little less bullish, predicting roughly 13% growth to a $7.9 billion level. Semiconductor sales traditionally account for about 40% of total distribution revenue, although the percentage has been slightly lower in recent years. Prudential-Bache sees the overall market growth continuing at a still respectable 15% rate in 1989, according to analyst Elizabeth Dorsey.

Other observers expect somewhat lower growth next year, based partly upon widely held assumptions that 1989 may play host to a cyclical economic contraction. But distributors should be well positioned to continue slow growth even in a recessionary environment, as long as they are better able to manage their inventories than during the previous downturn, says Toby Mack, executive vice president of the National Electronic Distributors Association (NEDA).

In any case, a general economic slowdown may not be as important to distributors as the simple issue of component supply and demand, notes Mike Worfolk, president of Schweber Electronics. He points out that most of the growth in the first half of 1988 was fueled by product shortages and increased prices, not by higher levels of unit shipments. Given that component supplies are expected to improve toward year-end and into 1989, Worfolk expects growth in the 5% to 10% range in 1989.

Gross profit margins, meanwhile, hovered around 23% in 1987, Dorsey says, below the 25% margins typical in strong years. Profit margins should approach their traditional levels this year, she predicts, due in part to the continuing DRAM shortage, keeping prices of that key commodity high. As a caveat to this predicted improvement, however, Dorsey notes that an increased reliance on systems sales with their lower margins could adversely affect overall profits.

Downward pressure could also be exerted on margins as more suppliers attempt to cut their costs by reducing the number of OEM customers with

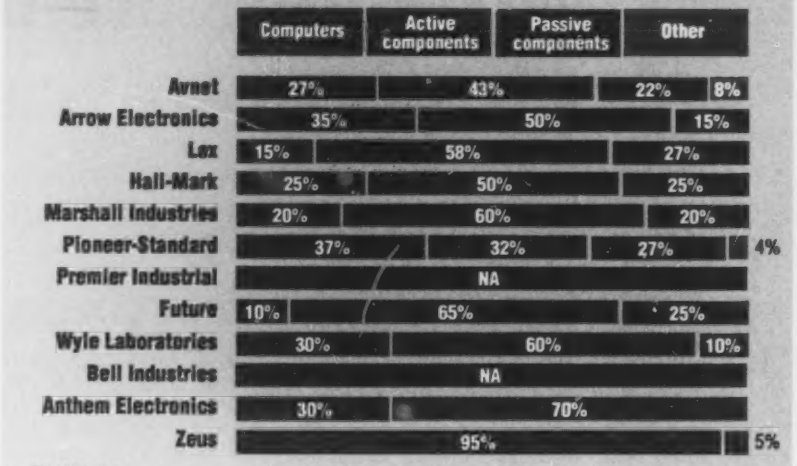
Economic slowdown may not be as important to distributors as the simple issue of component supply and demand, says Schweber president Mike Worfolk

Jon Allan Lewis

which they deal directly, says Tom Calder, vice president for marketing at Marshall Industries. "As these suppliers turn more to industrial distributors, competition in the field will increase," he says, "and that will keep margins tight."

While distributors believe the worst is behind them, the 1985-86 recession has had a lasting impact on the nature of their business. Gone are the days when the companies could profit by doing little more than stocking large inventories and providing one-stop shopping for OEMs and other value-added resellers. Suppliers are now demanding that the middlemen keep them better informed about shifts in customer demand. At the same time, "Our customers are energetically trying to reduce their expenses by calling upon us to perform a variety of value-added services," says Anthony Hamilton, chairman of Avnet Inc.

Top distributors — Product breakdown



FY 1987 data

Source: ELECTRONIC BUSINESS

Market restructuring

These market demands have begun to alter the basic character of the distribution business. Market consolidation has accelerated as the players attempt to gain greater economies of scale, more diverse product lines, and broader geographic representation. At the same time, the major distributors are branching out by providing value-added services such as component customization, testing and inspection; by setting up electronic data interchange (EDI) connections with their suppliers and customers; and by increasing their activity in the fast-growing systems sales marketplace.

The just-in-time production philosophy is playing a key role in much of this restructuring. OEMs and other integrators are looking to cut their inventory costs by keeping on-site stocks at a bare minimum. As such, they're relying upon distributors to keep the necessary components and peripherals in their warehouses ready for immediate shipping to keep the production pipeline flowing. To further expedite this process, many distributors are setting up "in-house stores" at their customers' sites. The distributor owns these inventories, but the customer agrees to maintain them on-site for rapid availability.

JIT arrangements not only require that the distributors provide all necessary components at a moment's notice, but that the parts arrive at the customers' doors error free. To meet this demand, distributors have beefed up their quality control and inspection departments, removing these responsibilities from their customers' shoulders.

Another related service, that of "kitting," is also much in demand. Kitting can range from simple prepackaging and shipment of related groups of components to actual subsystem assembly and programming. Schweber's Worfolk notes that the term "preproduction" might better describe the kitting operation. "We can source the production and deal with the 30 to 40 vendors supplying parts rather than have our customers perform that task," he explains.

Distributors hope for a 15% to 20% surge in revenue and better profit margins

Communications networks

To efficiently manage these expanded activities, distributors are setting up on-line connections between themselves and their suppliers and customers. Through such EDI programs, "we're working to facilitate the information flow," says Hall-Mark Electronics president Joe Semmer. "Our customers load us up with orders, and we, in turn, load up our suppliers with orders."

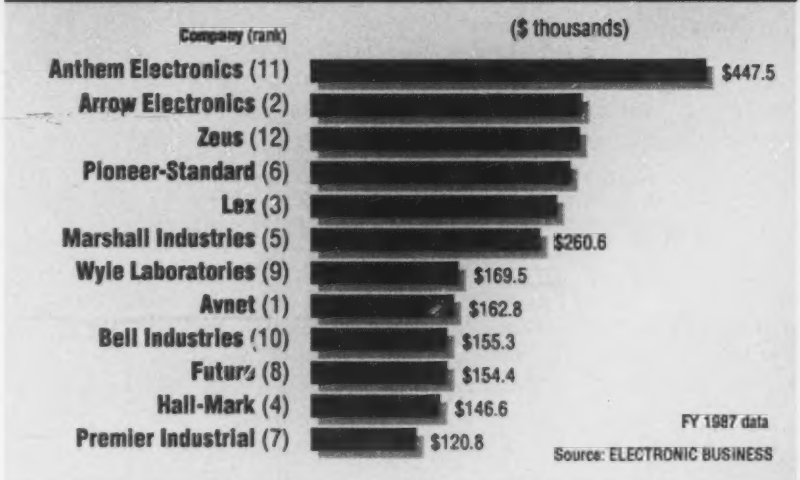
So far, though, most EDI setups consist only of customer-site terminals linked to the distributors' mainframes. While these facilitate ordering and the transfer of technical product information, they fall far short of the full potential of EDI, says Worfolk. That potential will only be realized through the advent of mainframe-to-mainframe links that will let customer and distributor host computers communicate directly, he says. Such links will further augment ordering and invoicing automation, but they must wait until EDI communications standards are hammered out by groups such as the American National Standards Institute.

Even with the growing emphasis on electronic links between the parties, the distributors still lack good methods with which to monitor and analyze fluctuations in supplier and customer inventories, says Mack at the NEDA. As long as this is the case, he warns, the industry will be vulnerable to rumors about impending parts shortages and to the double and triple bookings that customers place to protect themselves when supplies get tight. "A better tracking model would go a long way toward damping out the wide inventory gyrations that have occurred in the past," Mack says. ▷

For their part, distributors are struggling to maintain market share and improve profit margins in a dynamic business that is increasingly dominated by a few large players. Longtime leader Avnet accounted for about $1.3 billion of the industry's $7.4 billion total sales in calendar year 1987, up 12.1% from the previous year's revenue.

Avnet's Hamilton/Avnet division hopes to hold its lead in part through a restructuring move that separates its electronic components business from its growing computer systems and peripherals business. The company has virtually completed a major inventory centralization, with a flagship "megawarehouse" in Chandler, Ariz. Also in Chandler is a new IBM 3090-200E mainframe, which is being networked to the company's 4,000 nationwide terminals.

Top distributors — Sales per employee



Small firms get squeezed

"The ability of the large distributors to feed off a few centralized warehouses permits them to set up simple sales offices rather than complete inventories around the country," notes Fred Wolf, an analyst with Mabon, Nugent & Co. "This gives them better cost efficiencies and may result in the squeezing out of some of the smaller distributors," he says.

Arrow Electronics Inc. also increased its revenue 12.1% in 1987, to a total of $562 million. The company lost $15.8 million on those sales, but that bad news was quickly mitigated as Arrow successfully completed its acquisition of the distribution units of Ducommun Electronics Inc. this January. If the 1987 sales of these units — Kierulff Electronics, Ducommun Data Systems and MTI Systems — had been combined with Arrow's, the resulting revenue would have totaled about $940 million.

The success with which Arrow has combined its new and old operations has surprised competitors and analysts alike. The company's average daily order rate rose from $2.6 million during 1987's fourth quarter to $4.6 million in this year's first quarter. That rate surpassed the combined preacquisition order rates of the two companies, and analyst Dorsey believes Arrow should easily attain its stated goal of reaching $1 billion in revenue this year. "They've

Top U.S. electronics distributors

1987 rank	Company	Calendar year distribution revenue ($ millions) 1987	1986	Percentage change	Distribution as a percentage of total company revenue	FY 1987 revenue ($ millions)	FY 1987 pretax profit ($ millions)	Pretax profit as a percentage of total revenue	FY 1987 net income ($ millions)
1	Avnet	$1,285	$1,146	12.1%	77%	$1,547.1	$46.6	3.0%	$22.8
2	Arrow Electronics[1]	562	502	12.1%	100%	562.4	-15.8	-2.8%	-15.8
3	Lex[2]	541	501	8.0%	23%	541.0	5.6	1.0%	NA
4	Hall-Mark[3]	475	385	23.5%	43%	1,099.5	30.1	2.7%	16.8
5	Marshall Industries	356	269	32.1%	100%	286.6	11.0	3.8%	5.1
6	Pioneer-Standard[4]	320	276	15.9%	100%	254.6	8.6	3.4%	5.2
7	Premier Industrial	297	267	11.2%	61%	459.0	81.4	17.7%	48.3
8	Future	270	217	24.3%	100%	270.2	NA	NA	3.0
9	Wyle Laboratories	265	225	18.2%	72%	368.0	10.5	2.9%	5.8
10	Bell Industries	199	158	25.9%	49%	357.1	6.9	1.9%	3.3
11	Anthem Electronics	197	167	17.8%	100%	196.9	9.1	4.6%	5.0
12	Zeus	91	92	-0.7%	100%	89.1	-1.7	-1.9%	-1.0

[1] Acquired Ducommun's distribution business Jan. 1988. If the acquisition had been made on Jan. 1, 1987, pro forma combined sales would have been $940 million
[2] Data for U.S. distribution operations only
[3] Parent company Tyler Corp.
[4] Includes sales of 50% owned Pioneer/Technologies Group Inc. with fiscal 1988 sales of $91.7 million

done an amazing job of assimilating the two companies," she says.

The downside of the acquisition is the further leveraging of the parent company. In 1987, Arrow's debt as a percentage of total capital was 39.5%; after the acquisition it rose to about 66%, according to Dorsey. Arrow had to pay $7.2 million in interest in the first quarter of this year.

Troubling high debt

High debt as a percentage of total capital is endemic in the industry — typically spanning the 35% to 45% range — and analysts warn that distributors might have a hard time financing their operations should another slump occur. Still, this year's strong economic performances should help lower this statistic.

Another factor boosting this year's outlook is the impact of the 1986 Tax Reform Act. In fiscal year 1987, Avnet's net income fell from the previous year — from $23.9 million to $22.8 million — largely because its tax rate rose from 43.6% in fiscal '86 to 51.1% in fiscal '87. For the fiscal year closed June 30, 1988, Avnet's rate fell to about 39%.

No. 3 distributor Lex Services Plc announced a major restructuring of its Schweber Electronics division in mid-July. The changes include realignment of the firm's five regions and the establishment of sales and marketing, technology, regional services and operations managers for each region.

The fourth largest distributor, Hall-Mark, went against the consolidation trend in early July when its management team announced a plan to buy the company from parent Tyler Corp. Previously, Hall-Mark had been the subject of much takeover speculation. At press time, the deal had been signed, but not yet finalized, according to Semmer.

Fifth-ranked Marshall out-performed the rest of the top companies in 1987, with revenue jumping 32.1% over calendar year 1986 sales. The company continues to rely heavily upon its Japanese sourced product lines; approximately 19% of Marshall's 1987 sales were of Japanese products, making the company the largest distributor of these lines in the United States, according to marketing vice president Calder. □

Top distributors — Net income/total revenue

Net income as a percentage of total revenue	Return on equity	Return on investment	Cost of goods as a percentage of revenue	Sales per employee ($ thousands)	Net income per employee ($ thousands)	Five-year growth (Compounded average annual growth rate) Revenue	Net income	Capital outlays to net cash flow after dividends	Debt as a percentage of total capital	Fiscal year ended
1.5%	3.5%	2.6%	73.5%	$152.8	$2.4	6.8%	-16.5%	146.5%	25.7%	6/87
-2.8%	-16.4%	-10.0%	79.4%	308.0	-8.7	5.8%	NM	-13.0%	39.5%	12/87
NA	NA	NA	NA	278.9	NA	20.7%	NA	NA	NA	12/87
1.5%	9.4%	5.8%	74.8%	146.6	2.2	11.0%	13.0%	76.5%	38.4%	12/87
1.8%	9.4%	5.1%	75.1%	260.6	4.7	19.4%	NM	143.7%	45.7%	5/87
2.0%	15.4%	5.8%	75.2%	296.0	6.1	16.5%	53.7%	27.5%	62.5%	3/88
10.5%	18.1%	17.6%	51.5%	120.8	12.7	6.7%	6.9%	10.7%	2.5%	5/87
1.1%	NA	NA	NA	154.4	1.7	25.0%	-5.1%	NA	NA	12/87
1.6%	6.5%	4.3%	76.7%	169.5	2.7	13.4%	NM	49.1%	33.5%	1/88
0.9%	3.1%	2.4%	75.0%	155.3	1.4	11.8%	-15.3%	87.4%	23.0%	6/87
2.5%	7.3%	6.7%	76.7%	447.5	11.4	38.5%	27.3%	15.0%	7.5%	12/87
-1.1%	-5.9%	-2.4%	76.6%	304.1	-3.3	14.9%	NM	-461.6%	59.1%	9/87

NA = Not available
NM = Not meaningful

Source: ELECTRONIC BUSINESS

Services get the job done and can save time and money

The "not invented here" attitude has long ruled U.S. manufacturing. But electronics companies now are looking outside for design and assembly

BY ALBERTO SOCOLOVSKY

Uncle Sam knows it. The General Accounting Office told him so. Executives in the electronics industry know it, too. Outside services can do many jobs more cheaply and efficiently than if done in house. This represents quite a change for the electronics industry, famous in the past for shunning anything NIH — "not invented here." Moreover, readers of ELECTRONIC BUSINESS told us in a recent survey that they will be using more services in the future.

There are two main forces driving the trend toward expanded use of outside services. One is internal: many companies are following Allied-Signal Inc. and Honeywell Inc.'s example in downsizing by eliminating operations not critical to their major revenue sources. As a result, they must look beyond their walls for skills and capabilities they no longer have.

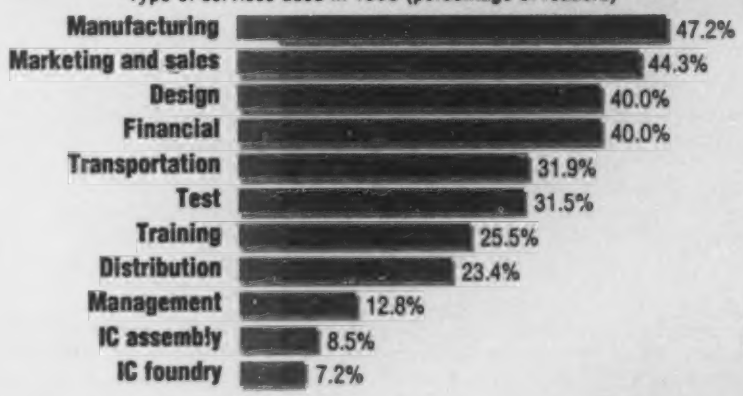
The other force is external: services work very hard for your money. They may also supply you with talent, skills and information that is either unavailable or too expensive if provided by a full-time employee. The market today for services to the electronics industry — ranging from contract assembly, design and distribution to executive recruitment, information services, management consulting, marketing, sales and training — is conservatively estimated in the $15 billion range.

The largest, and oldest, services are contract assembly (used by almost half of our readers) and sales representation. Design is close behind. But, according to our survey, the fastest growing sectors are IC assembly, followed by IC foundry services. Increasing popularity of ASICs is likely the main reason behind this trend. Companies design these chips themselves — or contract with a design service. They then send the designs out to a foundry. And the fabricated wafers are sent off to an IC assembler.

As more of our readers use services, they become more selective. Consequently, service providers must become more sophisticated and better capitalized. The largest service segment, contract assembly, is already being consolidated. Intense competition from domestic and foreign companies has forced United States-based assemblers to seek economies of scale. Capital investment requirements, meanwhile, are increasing for both manufacturing and design. This is especially true in assembly of surface mount components and design of ASICs. Many service companies, however, are small and specialize in labor-intensive operations. They cannot raise the massive capital required to automate. They, therefore, face extinction or, if they have valuable customers, absorption by a larger competitor.

Services used by ELECTRONIC BUSINESS readers

Type of services used in 1988 (percentage of readers)



Source: ELECTRONIC BUSINESS

IBM is the model

Many electronics firms have used IBM as a model, but few followed the computer giant's lead in the early 1960s by subcontracting the assembly of power supplies. More copied Big Blue a decade later in subcontracting the interconnection of computer backplanes, a laborious chore of stripping and wrapping wires from connecting point to connecting point. But it wasn't until the early '80s that contract assembly came into its own. Then, IBM gave major contracts to SCI Systems Inc. in the United States and to Thorn-EMI in Europe. They were paid to assemble PC boards. Subsequently, IBM's productivity — judged in revenue per employee — went up more than 15% in 1982 and 1983. IBM gained revenue quickly without having to hire new personnel or build new factories.

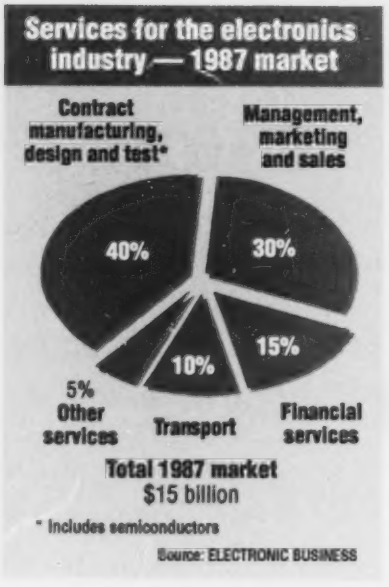
SCI's president A. Eugene Sapp

puts contract manufacturing in the United States today at $2 billion to $4 billion: $500 million of which belongs to his company. SCI's figure, however, covers more than just assembly. "We practice contract manufacturing as a full-service, full-turnkey operation, including the acquisition of materials," says Sapp. "Few do it on that basis."

Express Manufacturing Inc. of Santa Ana, Calif., for example, doesn't do it that way. Express Manufacturing is a $4 million regional assembler with 300 employees. "We work on consignment, providing labor only," explains president C.P. Chin. "That's equivalent to $40 million in turnkey, which includes purchase of materials and testing." Providing labor keeps EMI busy with big neighbor AST Research Inc., the fast-growing manufacturer of personal computers. SCI's Sapp recognizes the advantage of regional assembly. "That's why we're regionalizing our business," he says. "We operate all over the U.S. and in Scotland and Singapore."

Sapp estimates that in the United States, contract manufacturing is expanding as much as 40% per year. This growth suggests that customers are increasing the share of assembly work they give to services. "Many people are rethinking capacity planning," he explains. "We have customers who've moved manufacturing from their facilities to ours — and closed down their operations." SCI has a four-pronged strategy for expanding services: investment in SM technology; providing regional coverage in many geographic regions; signing up key customers; and moving toward more vertical integration. "The trend is to broad-based, multiplant services," says Sapp. The main drawback is that the investment required is constantly increasing. "An SM line costs up to $2 million, just for equipment," Sapp says. Still, he adds, contract manufacturers can amortize such massive investments faster than their customers — due to higher manufacturing volumes at a contract shop. "We've the potential to optimize utilization, rather than just tie up capital," explains Sapp.

Not usually considered assemblers, but performing an important assembly function, are the electronics industrial distributors that offer value-added services. These usually consist



of assembling multipart components such as connectors and potentiometers, a natural service for distributors that have inventory of parts and factory-supplied tools and training. A distributor service now enjoying a comeback, thanks to just-in-time (JIT) programs, is kitting. This consists of delivering groups of components to meet a customer's bill of materials in specified quantities and delivery dates.

Configuration of computer systems is another fast-growing value-added

Contract manufacturing is growing as much as 40% a year

business for distributors. Tony Hamilton, chairman of Avnet Inc. and head of his company's billion-dollar industrial distribution group, estimates that value-added services of all types, including ASIC design, represent 20% of his sales. The figure is lower for other distributors, but the total for their value-added services may be close to $1 billion.

When sleek European imports started taking over the U.S. sports car market two decades ago, the big U.S. automakers recognized that even they didn't have the styling talent required to compete, and went to Italian designer Pininfarina for help. Today, American electronics companies are doing much the same. For instance, the German-American firm Frogdesign, which Steve Jobs hired for the stylish Apple IIc portable computer, also counts Sun Microsystems Inc. and Jobs' new firm, Next, among its customers.

Aside from Arthur D. Little and nonprofit organizations such as Battelle Memorial Institute and Stanford Research Institute, there are few large firms concerned with circuit and product design, the traditional technological bastions at electronics companies. Most are small. "When the product succeeds and the [design] work grows, the customer forms its own engineering department," says Donald E. Pezzolo, president of Diablo Research Corp. of Sunnyvale, Calif., a $1 million firm that helps large, nonelectronics companies apply electronics technology in new places — like the home.

The Electronic Industries Association has awarded Diablo a contract to research power line carriers. The EIA is drafting standards on how home appliances will be controlled through household wiring. Appliance manufacturers are well represented among Diablo's customers. They could start their own engineering departments to design new electronic products. But they figure that they can get to market faster by subcontracting the design.

Letting others sell for you

The Chicago-based Electronic Representatives Association estimates that reps sell $40 billion worth of components, equipment, systems and — you guessed it — services, a year. Assuming an average commission of 6%, the reps' service may amount to $2.5 billion. The group itself is a service organization for sales representatives who perform a marketing service for electronics manufacturers.

Electronics companies, particularly components manufacturers, debate forever the pros and cons of a direct salesforce versus independent representatives. Often, personality is as much a deciding factor as the issues involved. For every rep who tells a story of a product line whose sales withered after the manufacturer hired its own salespeople, there is a manufacturer who claims to have re-

duced his sales cost by going direct. Yet the Japanese chip makers had no trouble recognizing the value of the representatives' service. Their initial penetration, and eventual dominance, of the DRAM market in the United States was spearheaded by sales reps.

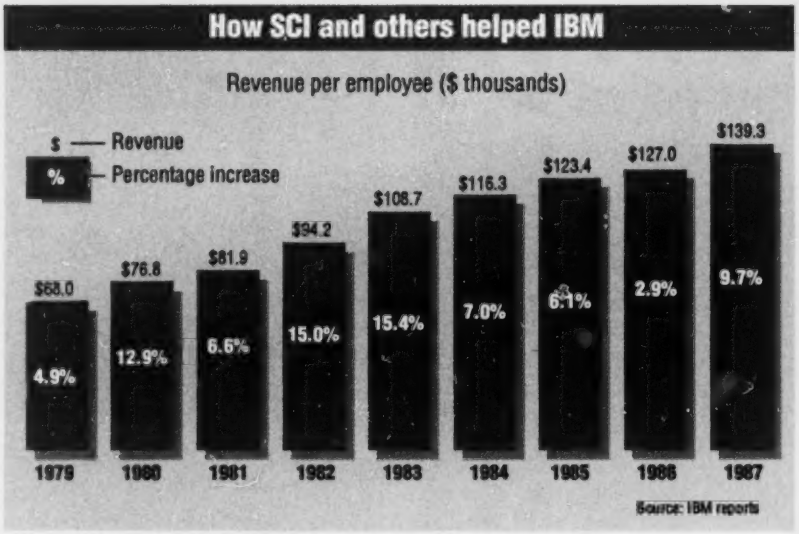
Many small manufacturers look at reps for more than sales help. They depend on them for management consulting — through reps' councils — and for market research. On a more formal basis, these two specialties are a growing market for management consultants and information services.

"Our information service consists primarily of syndicated market research," explains Ralph Finley, executive vice president for strategic planning at Dataquest Inc. of San Jose, probably the largest market research firm specializing in electronics technology and markets. Using an independent research firm has "an economic justification," according to Finley. "In the whole world, there may be a total of 40 specialists in a particular industry segment," he notes. "We can assemble a staff of six to eight of them — we have four just on electronic typewriters — and spread the cost across 100 clients."

Although demand for market information is increasing, Dataquest and International Data Corp. are the only companies devoted to electronics that have grown to respectable size. Most others are below $5 million in annual sales. Consequently, they must stay sharply focused on a narrow industry segment to be profitable. Meanwhile, new research firms, bringing a specialized skill or addressing a specific need, open up shop all the time. One of the newest entries is the Business Research Group of Cahners Publishing Co. Business Research, which has access to readers of Cahners' trade magazines, conducts market research on the acquisition and applications of information technology.

Don't buy, lease

Leasing, states the American Association of Equipment Lessors, is a service that allows business people to focus on what the equipment should do *for them* rather than on what it does *to them*. There are many financial benefits that derive from leasing; some are based on accounting rules,



IBM's big jumps in productivity (in annual revenue per employee) for 1982 and '83 coincide with its shift to contract assembly for its personal computers

some on tax provisions. For computer and electronics companies, however, the most important benefit is that leasing transfers the risk of obsolescence from the lessee to the lessor. Indeed, computers are the leading growth category in leasing, according to the AAEL, with 20.7% of the new leasing business in the United States for 1987. Telecommunications equipment was in fourth place with 9.6%.

"We make it easier to buy and sell," says Edward Herman, chairman and CEO of Equitable Lomas Leasing Corp., a financial services company that specializes in leasing computers, communications equipment, CAD/CAM and ATE to computer and electronics manufacturers. A popular type of lease among these companies, says Herman, is the operating lease. This type of lease meets accounting rule FASB-13, which allows off balance sheet financing, thus freeing the lessee from having to capitalize the equipment's purchase in the company's financial statement. "Under government procurement rules, operating leases provide defense contractors with better cost recovery: the equivalent of a rent," explains Herman.

IC assembly and IC foundry services are the fastest growing service sectors

It is difficult to estimate the dollar volume of leasing services for computer and electronics companies, because most lessors measure their business based on the acquisition cost. Factoring in major manufacturers such as Xerox, which have their own leasing arm, and leading rental companies that specialize in electronic and computer equipment, Herman estimates a volume of $5 billion in such equipment, plus at least a comparable amount for nonelectronic equipment, such as airplanes, which electronics firms lease. "The [leasing] industry average earnings are 14.5% after tax," says Herman. If so, what our readers pay for leasing may be double that, or about $3 billion. But then, this does not take into account the money leasing saves.

Ironically, as electronics companies buy more services, they can also provide more services. They concentrate on solving problems for their customers; not only by selling products but, increasingly, by performing services for them as well. At Digital Equipment Corp., for example, services already account for more than 30% of revenue. □

Why SMT won't give circuit board CAD firms a break

Revolving parts lists, systems integration, and hot spots are just some of the side effects of SMT that CAD firms wish they'd anticipated earlier

BY TONY GREENE

As surface mount technology takes center stage in the printed circuit board design arena, board designers want to be able to take full advantage of the benefits offered by the technology. At the same time, they want to avoid the problems that increased density, closer pin spacing, higher temperatures and an ever-changing library of parts are causing. In short, the designers want computer-aided design programs that are smart enough to handle all these problems and more.

All of which imposes new demands on makers of PCB CAD equipment, who find themselves having to deal with an increasing need for smarter routers; with the growing significance of thermal analysis; the difficulty of keeping parts libraries current; and with a definite trend toward integration of CAD equipment into complete board manufacturing systems.

Surface mount is not a new technology, but after being around for almost 15 years it is now coming of age in a manufacturing environment that wants denser, more complicated printed circuit boards. "At least half of our customers are doing SMT and 70% to 80% of the benchmarks we are doing are SMT," says Bruce Holland, president of Boulder, Colorado-based Cadnetix Corp. With 1987 revenue of $37.7 million in PCB CAD, Cadnetix is the fourth largest player in the PCB layout game, with a 5.2% share of the market, according to San Jose market research firm Dataquest Inc. The PCB CAD market, which is predicted to generate $796 million this year, is expected to grow at a compound annual rate of 5.2%, reaching $930 million in 1992.

The good thing about the recent push toward SMT is that it did not take PCB CAD vendors entirely by surprise. Cadnetix, Computervision Corp., Mentor Graphics Corp., Personal CAD Systems Inc. and Racal-Redac Inc., just to name a few, saw the need several years ago and began developing software that would be able to utilize SMT.

Hot spots

What they did not all fully anticipate were some of the ancillary issues that SMT has brought into the spotlight at the design end — issues such as thermal analysis. Current software allows PCB design engineers to create extremely dense, heavily populated boards, but these boards generate so much heat that they are useless after they are manufactured. Board makers today want to know if a board is going to work long before it has been produced or even before the art work has been done. Because of this, they want programs at the front end, in CAD, to do simulated thermal analysis of printed circuit boards.

Cadnetix's president Bruce Holland: "At least half our customers are doing SMT, and up to 80% of the benchmarks . . ."

CAD companies have come up with two distinct strategies for handling the hot-spots problem. The first is to produce thermal analysis software in house and make it part of the package when customers purchase CAD software. Beaverton, Oregon-based Mentor Graphics has pursued this strategy. "We were told by our customers that almost 50% of their field failure was thermal in nature," says president Gerard Langeler. He claims that Mentor's thermal analysis program, called Autotherm, is particularly fast, and that all of the program's beta sites have bought the program.

The CAD equipment makers' other strategy is to enter third-party agreements with firms that specialize in thermal analysis software — a kind of "leave it to the experts" method. Cadnetix, Computervision and Intergraph Corp. have all used the same company, Pacific Numerix Corp. of La Jolla, Calif., to supply them with the software.

Another thorny PCB design issue is the problem of connecting surface-mounted components to power and ground plans. In the past, with through-hole technology, this was no problem because component pins went through the board and made connections with all layers. Now, with SMT, it is necessary to have "vias" — solder traces that bridge inner layers of the board to make

these connections possible. "To truly take advantage of SMT you must have a good concept of vias: blind, partial and buried," says Andrew A. Perlowski, vice president for electronics for Bedford, Massachusetts-based Computervision, a division of Prime Computer Inc.

Besides being able to bury vias in the layers of the boards, CAD systems must be capable of dealing with closer pin spacing on surface-mounted devices. In the past, it was common practice to run traces between component pins, but now the number of pins on components and the spacing between them has made this very difficult. Components are also being placed on both sides of the boards.

It all adds up to make placement a major factor in the CAD process and to make the autorouter and placement router functions even more important than they've been in the past. "Autorouters and placement routers today have to deal with more data then ever before," notes David DeMaria, director for technical marketing for Racal-Redac of Westford, Mass. Racal-Redac is predicted to lead the circuit board CAD industry in 1988 with $76.4 million in sales and a 10.6% market share.

3-D chess games

On top of this, boards are being designed with more layers than ever before and routers must be able to solve routing problems for all the layers of the boards at the same time. Printed circuit board design is no longer a two-dimensional problem: "You can think of it like a three-dimensional chess game," says Terry Zimmerman, vice president for marketing for Personal CAD Systems, a leader in personal computer-based CAD systems.

Adds Jim Thompson, executive manager of electronic CAD/CAM at Intergraph in Huntsville, Ala.: "Traditionally, the shortest route was the best, but with SMT that is no longer true. Today, routers must be extremely intelligent to get off the top layer and down to where you have to make the connection."

Another problem for CAD equipment makers is the speed with which

Top PCB CAD vendors

Worldwide 1987 revenue ($ millions)

	Hardware	Software	Services	
Racal-Redac	$8.0	$57.8	$10.6	$76.4
Scientific Calculations	16.8	17.3	17.4	$51.5
DEC	34.0	0.0	5.6	$39.6
Cadnetix	17.9	15.4	4.4	$37.7
Computervision	13.5	13.3	10.2	$37.0
Zuken	19.0	12.5	4.7	$36.2
Hewlett-Packard	19.6	9.8	2.5	$31.9
IBM	21.9	3.3	3.5	$28.7
Calay	17.1	8.1	2.0	$27.2
Mentor	11.4	9.0	3.8	$24.2
Sharp	6.8	7.9	1.6	$16.3
P-CAD	0.0	13.6	2.0	$15.6
NEC	7.6	6.2	1.6	$15.4
Fujitsu	10.2	2.6	1.4	$14.2
Sun	12.5	0.0	1.6	$14.1

Total 1987 market $796 million

Source: Dataquest Inc.

Don't ignore through-hole

A wave of surface mount technology has crashed over American makers of circuit board manufacturing equipment — but it's the Japanese equipment makers that have ridden it in. However, U.S. manufacturers are now diving into the SMT equipment business with gusto and success. U.S. sales of SMT production equipment are predicted to reach $377 million in 1988, with the SMT portion of circuit board assemblies reaching 15% of the total market [ELECTRONIC BUSINESS April 15, 1988 p75].

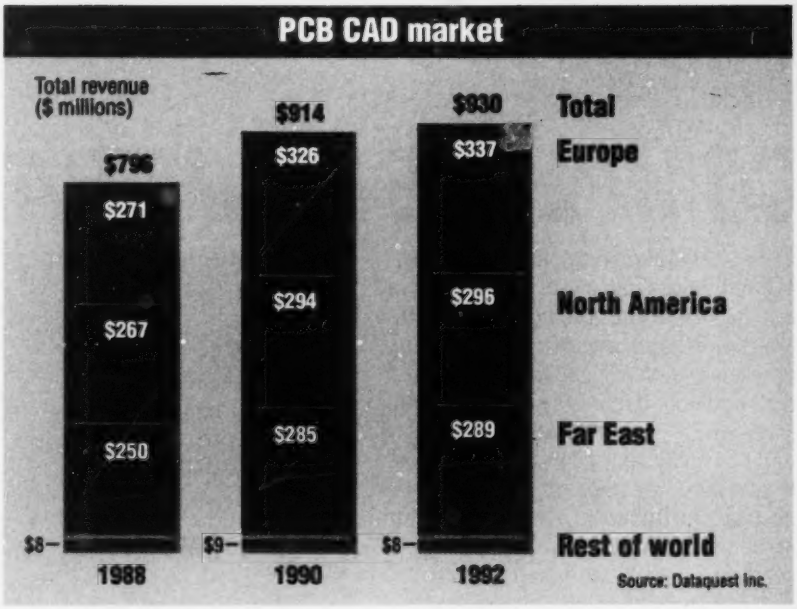
But there's still an ocean of older technology out there. In fact, sales of through-hole machines are paying for SMT development at the big equipment manufacturers, such as Universal Instrument Corp. of Binghamton, N.Y. "We're maintaining a large backlog of through-hole equipment. Through-hole experienced a 10% to 15% growth last year," remarks James Roth, Universal's vice president for marketing and sales. Of Universal's $250 million-plus in sales last year, almost two-thirds was in through-hole gear. But almost all of the 8% of sales that the company spent on product development went into SMT.

Independent analysts confirm that through-hole is not to be written off yet. Charles-Henri Mangin, president of Ceeris International, an Old Lyme, Conn., market consulting firm, says, "We're going to see [steady] sales of through-hole equipment for the next five years; it will always be profitable because the product development cost is already amortized. But U.S. manufacturers need to invest through-hole profits in SMT product development." Why? The market for SMT equipment is growing 40% to 50% annually, according to Mangin, and he expects it to maintain that pace for several more years. □

new SMT devices keep appearing. Parts libraries, which contain symbols for the components that are to be placed on boards and which are purchased with CAD software, can be out of date the day they are purchased. They continue to get further out of date as component makers catch up with the demand for SMT devices.

CAD vendors are coping by making libraries ultimately user-interactive, allowing customers to update their libraries as they need to use a new part. And the vendors are updating their own libraries, on average, twice a year. Another solution is to bring together the CAD system users, to enable them to share their libraries. Mentor is an avid practitioner of user conferences; over 300 people participated in last year's North American users' group meeting, boasts Mentor president Langeler.

Systems integration is another nagging issue. PCB manufacturers want increased access to data at the front end of the design process so that they can use the data generated by CAD to drive manufacturing and test equipment. "Integration is a challenge on the front end and the back end of production," says Langeler. "On the front end, we are coupling with design engineering and on the back end, with testing and packaging. Test engineering is going to play a major role in the future of CAD."



As if this weren't enough, PCB CAD vendors anticipate further demands from the push toward hybrid circuit boards, and from increasing utilization of high-speed chips.

Hybrid boards will take advantage of several technologies at once, such as SMT, buried components and mixes of analog and digital design rules. "We are finding a lot of interest on the West Coast and Canada for hybrid design," says Racal-Redac's DeMaria.

And higher speed components will force the pace. Says Cadnetix's Holland: "New high-speed CMOS semiconductors are going to explode into the commercial board market. It is not going to be a question of how well you handle high-speed design, but whether you can do it at all." □

AOI gets a boost from SMT

Automated optical inspection (AOI) equipment is reaching new heights in the testing of bare circuit boards, helping meet quality demands as the number of board layers climbs and as shrinking linewidths put pressure on conventional electrical testing. Surface mount technology is also pushing manufacturers toward AOI, as optical inspection of outer layers becomes important. Last year the world market for AOI gear was worth about $55 million; it should grow 18% in 1988 to $65 million, according to Dataquest Inc.

The market research firm credits two players with cornering the AOI business: Orbot Inc. of Woburn, Mass., with 1987 sales of $25 million; and neighboring Optrotech Inc., which Dataquest estimates had $21 million in sales last year. "We grew 90% last year and expect to grow 60% in 1988," boasts Paul Manikas, Optrotech's marketing manager. "The industry is maturing and our customers are looking for specific capabilities in AOI equipment," he says. According to Manikas, some customers are buying AOI just to inspect the outer layers of surface mount boards. Others want the AOI equipment to integrate with computer-aided design and manufacturing systems.

But that's not where the bulk of the action is. Says Victor Bunze, marketing manager for another vendor, Visionetics Inc., based in Brookfield Center, Conn.: "SMT is becoming mainstream, but right now the mainstream is in inspecting inner layers." Does that mean more business for more AOI firms? Not likely. As the industry matures and technologies become more complex, the cost of staying in the business is going to become prohibitive for some of the smaller players. "It costs $5 million to $10 million to get a new machine rolling," explains Bunze. "I doubt the industry is going to get any bigger. It's not virgin territory anymore."

Orbot's president Aaron Mankovski agrees that the industry is maturing, as witnessed by the fact that small board makers, those doing $5 million or less in annual sales, are buying AOI. "It shows that AOI is necessary to stay alive in the market," he explains. □

Vision systems vendors sense better profits in OEM sales

Burned by selling to end users who rarely knew what they wanted, makers of machine vision gear are going for 50% gross margins on sales to OEMs

BY SYLVIA TIERSTEN

When their sales to the automotive industry fizzled in the 1980s, machine vision companies had a choice: they could diversify — or they could die. Some, alas, did the latter. The survivors chalked up over $450 million worth of machine vision system (MVS) sales in 1987, according to Bader Associates, a market research firm in Mountain View, Calif.

To replace fading automotive sales, a number of vision companies targeted customers in electronics, food processing and pharmaceuticals. Some of these customers, it turned out, weren't looking for turnkey systems to beef up their production lines. Instead, they wanted a kind of "vision widget;" a relatively inexpensive vision add-on to beef up their product line.

That's why Cognex Corp. backed into the OEM market in 1986. By then, "OEMs were getting pressure from their customers who didn't want to buy their own vision systems," recalls Robert J. Shillman, president and chief executive officer of the Needham, Mass., vision firm. Customers in the semiconductor field, he reflects, "don't want the hassle of vision. What they really want is a wafer prober that works right — or a robot that works right."

Currently, Shillman says, Cognex relies on OEM sales to electronics/semiconductor firms for $4 million, or 80% of its annual business. Cognex makes a high-level, single-circuit board vision system that may be integrated into equipment for on-line gauging, part identification, wafer alignment and identification, IC brand and package inspection, or SMD inspection.

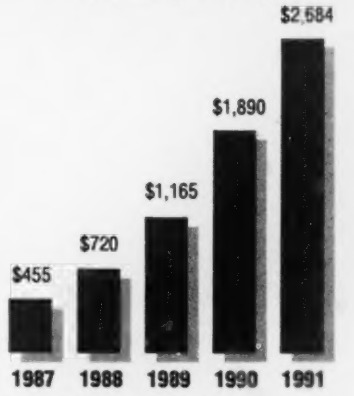
OEM sales, a burgeoning niche in the MVS market, are now a $20 million business, estimates George Gagliardi, president of ImageTech Consulting, in Concord, Mass. Over the next five years, he anticipates an annual growth rate of 15% to 20% in this OEM segment, compared with 10% to 15% for total MVS sales. But that's if you include "captive solutions" in your figuring — or original equipment manufacturers who build their own vision add-ons.

Several MVS companies have been "reasonably successful" in carving out an OEM niche, notes Nello Zuech, president of Vision Systems International, Yardley, Pa., a consulting firm to the automated vision equipment industry. It's a good short-term strategy, he reasons, but vulnerable in the long run. Once OEMs see the value of a vision subsystem, "they inevitably investigate ways of designing and building it themselves," he contends. "Why should they continue to pass that business on to a supplier?"

To succeed as OEM suppliers in the long run, Zuech believes, vision companies will have to do some product innovation on their own, keep prices down and avoid high engineering costs.

Machine vision market

U.S. market of machine vision systems* ($ millions)



* Includes products, fixturing, systems software and engineering

Source: Bader Associates

Beware new tech

Above all, he observes, successful suppliers should watch out for evolving trends. Cognex, he notes, now offers a basic chip set for high-speed alignment with a correlation image processing function. While OEMs currently buy an entire camera system from Cognex, in the future, he muses, they might confine their purchases to the chip sets alone.

Initially, though, an OEM can trim considerable risk, time and cost from the product development cycle by working with an established vision company. When Micro Component Technology Inc. of St. Paul, Minn., sought a "smart" solution for verifying the correctness and quality of marks on IC devices, "we went shopping for existing vision technology," explains David Barnes, general manager of MCT's systems division.

MCT's partner was Itran Corp. of Manchester, N.H., which manufactures in-process vision inspection systems for the automotive, electronic and chemical industries. Bringing the finished product to market took three years — about half the time that MCT would have needed for a solo effort, Barnes believes.

MCT didn't want "a company that tries to be everything to everybody," says Barnes — "a company that gets so caught up in the trap of trying to serve every industry, that it becomes consumed in special engineering and special applications."

Cognex is supplying Angstrom

Measurements, Sunnyvale, Calif., with an automatic image identification and analysis subsystem for a new line of scanning electron microscopes designed for semiconductor wafer inspection. "Cognex had an existing image processing system that was 80% of what we needed, and they worked very closely with us to bring [it] up to 100%," explains Angstrom's president, Lloyd R. Norville. Development took about 15 months, and two units are currently being beta tested. If all goes well, Angstrom plans to buy about 50 vision subsystems a year from Cognex, for a unit price of $15,000.

Another strategy for addressing the OEM market is to focus on more or less generic hardware to fit a broad range of industries and applications. Datacube Inc., based in Peabody, Mass., sells board-level hardware for real-time image processing.

Datacube's market is 80% OEM — "which we feel very comfortable with," says marketing manager Susan Snell Solomon. Gross profit margins for Datacube boards average out at 30% to 35% for boards that are priced in the $3,000 to $5,000 range.

Better bottom line

For OEMs that shoulder specific application development costs, profit margins need to be higher. "They are poor to begin with — and tend to improve over time," says David Wiltbank, vice president for marketing for View Engineering, Simi Valley, Calif. His company, which claims to have installed over 4,000 vision systems worldwide, derives about 6% of its revenue from OEM sales.

"You put a lot of money into an OEM situation to develop the product and exact application for that customer," Wiltbank says. Given sufficient repeat business, margins tend to reach what he calls "reasonable standards" — say, 50% gross, with perhaps 10% to 20% after taxes. Cognex, for one, claims to have realized gross profit margins of 68% or better on many of its OEM products over the past four quarters.

Although prices are characteristically higher for end users than for OEMs, margins on end-user products "typically get gobbled up in support engineering field work," says Joseph E. Campbell, general manager for the industrial controls and machine vision operations at Automatix Inc., in Billerica, Mass. Automatix earns 15% of its revenue from OEM vision engine sales.

Volumes vary from OEM to OEM, but 200 to 500 units a year "can be pretty attractive," Wiltbank says. High-volume sales, however, are anything but typical in today's OEM vision industry. International Robomation/Intelligence (IRI) in Carlsbad, Calif., expects to supply about two vision engines a month for bottle inspection equipment. The OEM customer, Inex/Vistech Technology Inc. in Riviera, Calif., will pay $20,000 per IRI add-on.

OEM sales of vision systems should grow at up to 20% annually

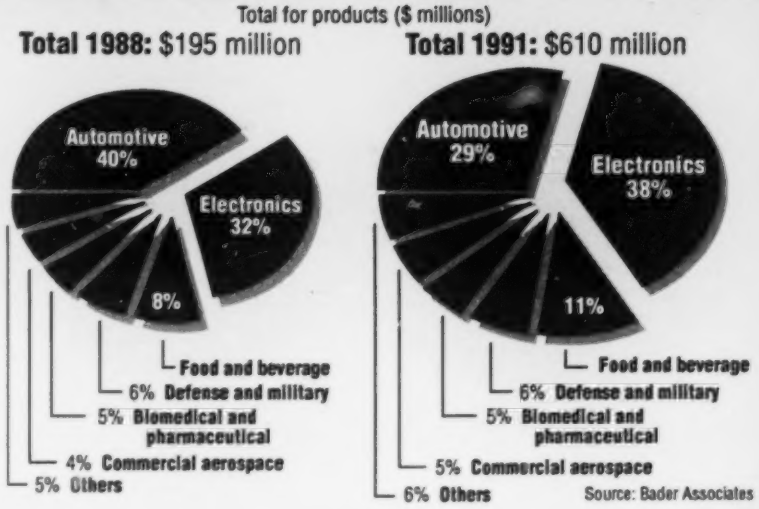
At this stage, 100 units to a given OEM is more than respectable for a vision company — and doesn't tempt the OEM to make the vision component in house, notes Salvatore D'Agostino, director for sales and marketing at Computer Recognition Systems Inc., Ayer, Mass. At 1,000 units, "an OEM might begin to consider it," he says.

However, most vision companies seem unwilling to commit to 100% OEM business. If anything, companies such as View Engineering are moving in the opposite direction. In the 1970s, View's primary business focus was the selling of an alignment device for wire bonding to OEM customers. Singled out by General Motors Corp. for major R&D investment, View reoriented its strategy in the 1980s. "After a while we said to ourselves, 'there are other opportunities in the machine vision business,' " notes Wiltbank. "If we supply a complete system, the revenue is $100,000 to $150,000 per sale rather than $5,000 to $8,000 per sale, and we thought that was the way we wanted to go."

But there are dangers in overreliance on OEM sales. Not too many years ago, IRI had an exclusive contract with GM Fanuc Robotics Corp. of Auburn Hills, Mich., to supply $60 million worth of vision components over a five-year period. IRI realized about $1.25 million in sales before GM drastically cut back on its automation requirements, recalls Donald Mead, vice president of IRI's Automation Systems Group.

Computer Recognition Systems, which derives one-third of its sales from OEMs and two-thirds from end users, considers its current mix highly advantageous. From a technological innovation standpoint, "we like staying in touch with end-user needs," says D'Agostino. "You learn more about the marketplace and can engineer a product better if you are not in an OEM ivory tower." □

U.S. market for machine vision products



Can disk-drive test makers meet the test of time?

Self-testing disk drives are just one of several worries for makers of drive-test gear. Standard test chips may help

BY BRIAN DEAGON

Times are good for the manufacturers of disk-drive test equipment. A boom in hard disk-drive sales has fueled a parallel explosion in sales of disk-drive test equipment, for the simple reason that people want to insure product integrity.

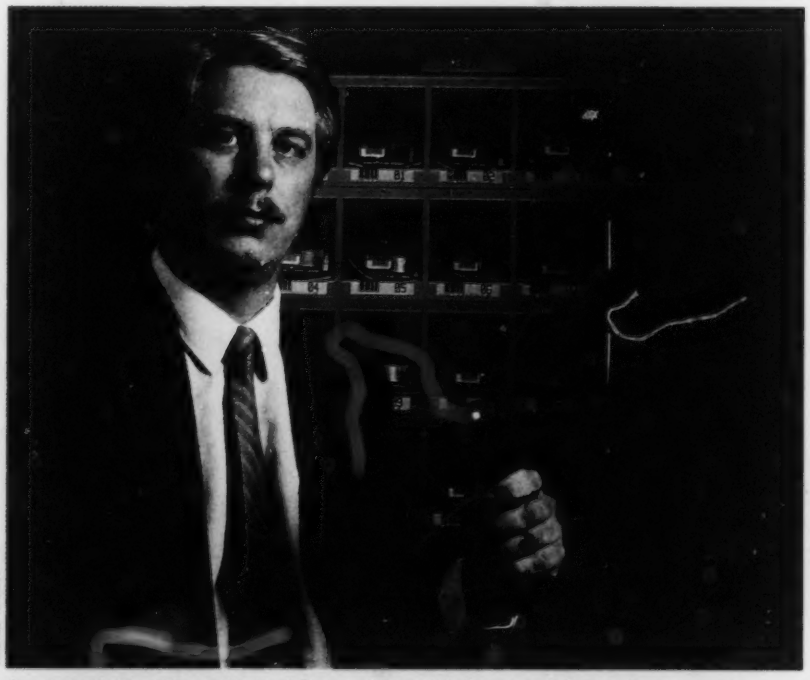
But it's not easy for test-equipment executives to keep abreast of the fast-moving drive industry. As a result, they're being forced to devise new strategies for dealing with self-testing drives, not to mention drive makers that want to get into test equipment markets themselves.

The U.S. market for disk-drive test equipment is projected to grow to $147 million in 1988, compared with $90 million in 1987, according to Peripheral Research Corp., a Santa Barbara, California-based market researcher. However, there will be a significant tapering off of sales by 1991, says Dennis Waid, Peripheral Research president. "We've been filling a big void in microcomputers that didn't have a hard disk drive. Once filled, we see less demand for disk-test equipment," he says.

But this is not the primary threat to greater vitality in the disk-test equipment industry. Technology rolls on, and the testers may have to learn a few new tunes. Several danger signs are out. For one, disk-drive manufacturers are changing the way that computers and disk drives communicate with each other. They're also building more compact disk drives, which places real estate at a high premium. The result is that the pins and connectors placed on the drives to test them are slowly disappearing and the data needed to evaluate disk drives is getting harder to retrieve.

No one is forecasting a quick death for the drive-test gear industry. On the contrary, demand should remain strong through 1990 because of the ongoing boom in disk-drive sales, analysts note. In addition, certain niche markets in the disk-test industry appear safe from any technology changes — disk head recorders and disk certifiers should remain strong, for example, as should sales of disk-test stations and board testers.

In fact, sales of disk-test analyzers — a subset of the disk-drive test equipment market — should grow to about $26 million this year, compared with $22.5 million last year. Sales in 1989 are pegged at $28 million, says Waid of Peripheral Research. Test analyzers peer underneath the skin of disk drives and reveal where the most minute flaws exist. New directions taken in the next few years could spell boom or bust for this crowd.



Michael Grecco

Cambrian's Bert Munnikhuis: "There will need to be more joint venture arrangements with the drive makers. Those that don't [have them] will be out of the loop"

In-house threat

Adding fuel to the fire are in-house development efforts at major disk-drive suppliers and users, such as Control Data Corp., IBM and Storage Technology Corp. The in-house work has already eliminated the need for some to buy drive testers. So a challenge for the drive-tester makers is to build products that are cheaper for customers to buy than make themselves.

"There is concern about the future of this industry. We have to antici-

pate what's coming. We'll change, as long as we have enough notice to do the engineering beforehand," comments George Robinson, president of FlexStar Corp., a Milpitas, California-based maker of test equipment.

The history of drive testing comes from the early days of computers, when disk-drive failure was more common. Most disk drives communicate with computer systems via an interface known as ST506/412, but it is more primitive and prone to failure than newer alternatives. The ST506/412 interface, coupled with unsophisticated disk controllers, forced users to understand why some disk drives wouldn't play. The test industry blossomed as a result.

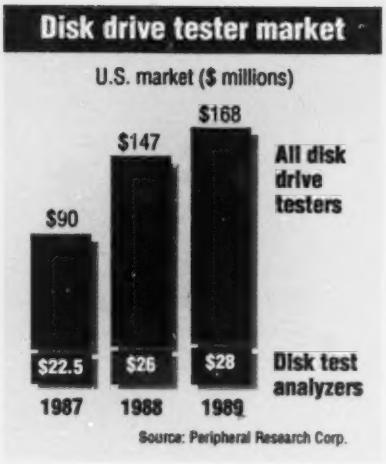
But disk-drive manufacturers have eliminated many of the problems with new, so-called "intelligent" interfaces. These utilize built-in microprocessors that allow more features to be packed into a drive. The most common versions are the Small Computer Systems Interface (SCSI); Enhanced System Design Interface (ESDI); and Intelligent Peripheral Interface (IPI). They contain features that disturb the disk-test equipment industry — like the ability to be programmed to mask technical flaws that exist within the drive. This makes it more difficult for testers to dissect a drive to learn its true behavior.

"We're not thrilled with giving the customer all the test points they used to have," notes Kurt Funch, director for test engineering at Maxtor Corp. in San Jose. Nonetheless, Maxtor has considered ways to build pins and connectors into the drives to allow users more access to data.

Creative use of microprocessors and the shrinking of disk drives are the nemeses of tester makers. And it could get worse. Several major disk-drive vendors fancy building their own test equipment. They also favor building drives that test themselves routinely in order to optimize drive performance.

There is some disagreement in the industry regarding self-testing drives. The drive companies that currently mask data acknowledge that buyers are concerned. For instance, masking errors could prevent a user from recognizing that a drive is slowly deteriorating.

"I believe the systems integrator will want to get at that information," says Stuart Mabon, president and chief executive of Micropolis Corp., a leading drive maker in Chatsworth, Calif. "The complexity of the drive makes it essential for responsible buyers to understand how the drive works and how to diagnose problems."



Unwelcome response

Mabon doubts the disk-drive industry will mask too much data because it could create an unwelcome response from buyers. Still, Micropolis is one of several companies reconsidering the way drives are tested.

Several big drive makers fancy making their own test gear

Others include Conner Peripherals, Control Data, Maxtor, Quantum Corp., and Seagate Technology. These vendors spend millions of dollars on testers. Building intelligent drives with on-board testing capability could be cheaper than relying on outside vendors for testing, although the jury is still out.

However, one problem with achieving this is that the disk-drive industry is much larger than the disk-drive test sector, notes Hank Pselos, sales vice president for Irvine, California-based Applied Circuit Technology, a division of Shugart Corp. "We need to continue to enhance test capability, but a big obstacle has been that the drive manufacturers each have a different way of testing," he adds.

This lack of standardization is an obstacle that many in the industry are trying to resolve. Meanwhile, ACT and several others are trying to work closer with drive makers.

Bedding down with the drive manufacturers will be quite a challenge, industry watchers say. Strategic alliances could evolve into new development contracts to fuel growth.

One successful venture belongs to Cambrian Systems Inc., a Westlake Village, Calif., supplier of media and head testers, servo-writer testers, and disk-drive test stations. Cambrian worked closely with Seagate to build an intelligent disk-drive station able to test 8,000 drives at once during the time-consuming "burn in" process. Cambrian is also talking with Quantum and Control Data.

"The test equipment industry needs to take on another face," says Bert Munnikhuis, Cambrian engineering vice president. "There will need to be more joint venture arrangements with the drive makers. Those that don't [have them] will be out of the loop."

One problem facing the disk-test industry is an unwillingness, or an inability, to invest the money for R&D projects with the large drive manufacturers. There are about 35 companies active in the test area, with an average company size of only $5 million or less.

On the other hand, not all troubles should be placed at the test equipment doorstep. Attempts to standardize disk testing have not been supported by the drive manufacturers. As a result, test equipment manufacturers have to build equipment that meets varying specifications. This, in turn, has created a fragmented test industry.

One proposal is to build a standard test chip into disk drives. In theory, the test chip would allow disk testers to tap into the vital data before it becomes masked. A proponent of this approach is Wilson Laboratories Inc., Orange, Calif., a leading builder of disk-test analyzers. "Our plan is to go to higher levels of testing for intelligent interfaces," says Jim Dietz, engineering vice president. Building test chips would allow access to all the vital data without affecting a drive's data integrity, he notes. □

Taiwan's electronics industry moves upmarket

No longer content to remain the site of cheap assembly, the country is striving toward higher value-added products

To really understand the impact Taiwan will have on the semiconductor industry, you have to know why the country is in transition. For a variety of reasons, Taiwanese manufacturers are heading upmarket across a whole range of industries. They are leaving behind their image as manufacturers of cheap, shoddy or imitation goods.

Korea and Taiwan are often mentioned as exhibiting the same trends, but the driving forces are quite different. Korea is dominated by large, vertically integrated companies — the *chaebol* — with massive government investment and direction for strategic industries.

Taiwan, by comparison, is more like Silicon Valley. You find in Taiwan the same entrepreneurial spirit, the same willingness to trade hard work for business success and the opportunities to make it happen, that you find in Santa Clara. Even Taiwan's version of Wall Street will seem familiar to many of you. There's a red-hot stock market where an entrepreneur can take a company public and become rich overnight.

In response to the overall trade situation, Taiwan has acted in a number of areas: reducing its own import tariffs on a range of products, widening its market to foreign goods and services and spending more on capital-intensive domestic public-works projects. Even boating and coastal fishing are being opened and targeted as tourist attractions.

Currency exchange rates are also changing the nature of many Taiwanese enterprises. Over the past few years, the Taiwan dollar has appreciated dramatically against the U.S. dollar, nearly 20% in 1987 alone. Clearly, Taiwan is losing its edge as a source of low-cost labor.

The government is actively encouraging Taiwanese companies to look for more domestic markets, to find export opportunities in countries other than the United States, to move upmarket to products of greater sophistication with greater added value and competitive worth, and to increase R&D expenses.

BY JAMES E. DYKES

Former president and CEO of the Taiwan Semiconductor Manufacturing Company Ltd., Dykes also headed the semiconductor operations of General Electric Co. This article is an excerpt from a speech Dykes recently gave in Arizona.

The electronics industry accounted for 4.2% of Taiwan's GNP last year and 20% of the value of exports. Planners talk about raising the proportion of such technology-intensive industries from the current 24% to 35% of the manufacturing sector by next year.

You can look at semiconductors as a microcosm of this overall trend.

As you know, semiconductor consumption is a barometer of end-use electronics production. According to Dataquest Inc., of San Jose, last year's total Taiwan semiconductor consumption was about $1.1 billion out of a worldwide consumption of $37 billion. This year, Taiwan's semiconductor consumption is projected to rise by 31.5%, versus 20% worldwide. In dollar terms, Taiwan's share is expected to grow to more than $3 billion over the next five years, for a compound annual growth rate of 22.5%.

The major chip end users in Taiwan are manufacturers of personal computers and associated products and consumer electronics equipment: chiefly VCRs and TVs. Broken down by segments, the personal computer area will show 22.3% compound annual growth in the next five years, followed by the VCR segment at 11% and TV production at about 8.5%.

Two trends here underscore the move upmarket from test and assembly activities: One, the Japanese are moving production of high-performance consumer electronics to Taiwan. And two, the government is encouraging Taiwanese companies to develop their own manufacturing skills in products with high growth potential: CDs, digital TV, digital audio tape.

The semiconductor industry in Taiwan is beginning to blossom. It's interesting to note that although Taiwan's growth as a semiconductor supplier was fueled largely by foreign firms until the early 1980s, the island's first semiconductor factory [for transistors] was started in 1963 by a native Chinese with technology developed at Cheng Kung University.

Following that, of course, there was a virtual explosion of discretes production, beginning with General Instrument Corp., which established a facility for germanium transistors in 1965. That was soon followed by investments in assembly facilities by Texas Instruments Inc. and American Microsystems, and later by a host of others.

By 1984, there were 57 companies and organizations in semiconductors: 13 of them in ICs and 44 in discretes and optoelectronics.

The Hsinchu Science Park [about one hour from Taipei] is home to an increasing number of semiconductor companies alongside other firms engaged in electronics design and production. There are about 70 high-technology companies located there today. The concept is to have semiconductor producers and customers in the same industrial complex.

Taiwan has a combined capability

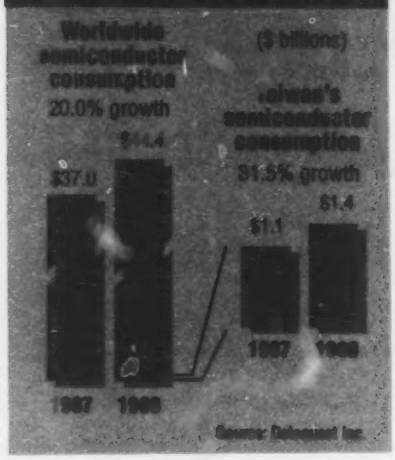
to produce 61,000 4-inch wafers per month now. But with already announced expansion plans, by 1990 Taiwanese producers will have the additional monthly capability for 80,000 6-inch wafers and 35,000 5-inch wafers.

Taiwan's future IC design efforts will likely focus on ASIC circuits and CAD tools. Process options will include submicron CMOS and several others: BiCMOS, CCDs, power ICs, thin-film devices, and gallium arsenide. Package development will be directed at high pincount and multichip, multilayer configurations.

Yet, much work remains to be done for this to happen. If Taiwan is to achieve its IC goals in the next five years, it must develop an infrastructure adequate to serve local industry needs. The most pressing need is for a locally based network of material, equipment and service suppliers to support the growth of the industry.

Let me give you a sense of that projected growth. Winbond is a maker of ICs for the personal computer, telecommunications and consumer electronics industries. It now has sales of less than $35 million, but plans to be a $100 million company by 1991, with 300 employees instead of its current 110.

Taiwan's fast growth in semiconductor consumption



United Microelectronics Corp. is building a new 6-inch fab to add capacity of 30,000 6-inch wafers per month. The firm expects to spend about $140 million over the next three years for capacity additions.

Taiwan Semiconductor Manufacturing Company Ltd. [TSMC] is building a new manufacturing facility in the science park, with a capacity for 30,000 6-inch CMOS wafers per month, although a portion is convertible to 8-inch. The entire facility is designed for submicron geometries, but initial production will center on 1.2-micron feature sizes. We expect it to be operational by the end of next year.

As you can see, Taiwan is growing and maturing. It is becoming a more respected competitor in the world's economy. There are risks and rewards for technology companies that wish to ally themselves with the most dynamic country in East Asia. The risks generally have to do with issues of technology development and availability. The rewards generally have to do with what you might expect from dealing with a proud, talented and hard-working people: quality products at competitive prices. □

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Computers: In the midst of a drought

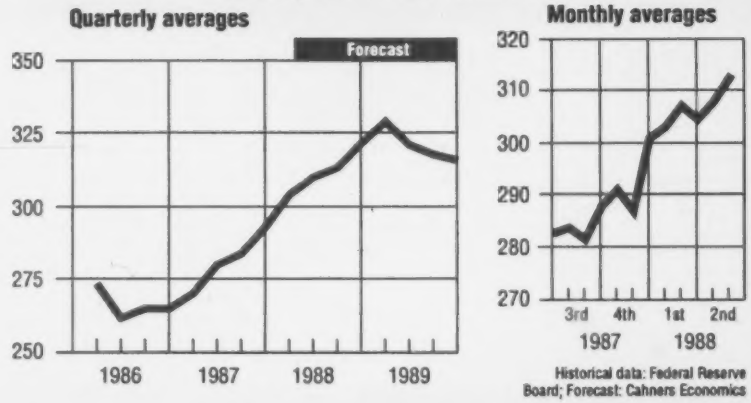
Computer equipment manufacturers are suffering through their own type of drought. Not enough memory circuits to quench the demand. According to *Electronics Purchasing* surveys, memory leadtimes jumped from 8.7 weeks in January of this year to 16.2 weeks in July, as supplies remained scarce. So the upward pressure on prices is on. This may be a factor in the slowing growth rate of new orders for computers and office machinery.

New orders dipped 1.3% in May from an upwardly revised figure in April. Although the $5.3 billion for May stood almost 10% above new orders of a year ago, the growth rate may already have reached its peak. The rising leadtimes and prices may be stretching out demand for new computers. This could slow order growth this year, but on the plus side, throw it into 1989, when supply constraints are expected to ease.

Other indicators for the computer and office machinery industry were optimistic. Output swelled 14% in May over the year-ago level and shipments advanced 15% to total $5.4 billion for the month. Those are right in the ball park of our forecasts. In April, exports of computers and office machines surged 34% compared with April 1987, while imports advanced about 24%. As a result, exports of $1.9 billion outpaced imports of $1.7 billion, leaving a trade surplus for the second month. □

Computers and office machinery — Industrial production

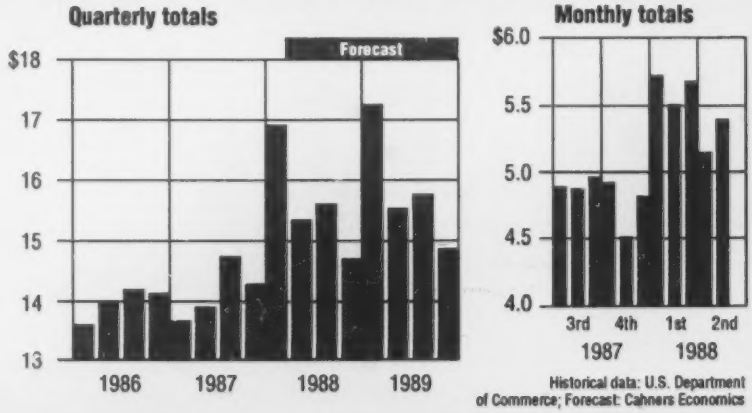
Seasonally adjusted index, 1977 = 100



Historical data: Federal Reserve Board; Forecast: Cahners Economics

Computers and office machinery — Shipments

Seasonally adjusted ($ billions)



Historical data: U.S. Department of Commerce; Forecast: Cahners Economics

Computer market database

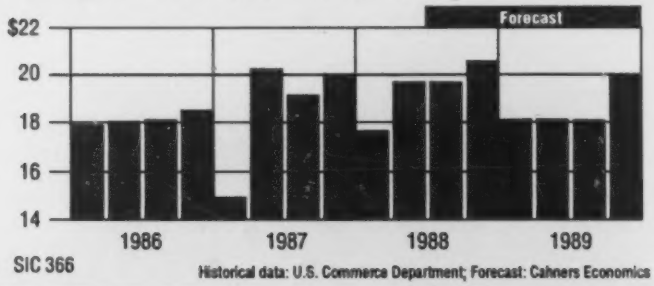
	Latest month	Previous month	Change	Year ago	Change	Next year	Change
Industrial production (SA,1977=100, May)	313.4	308.6	+1.55%	274.0	+14.38%	322.9	+2.90%
Shipments (SA, $ millions, May)	$5,402	$5,168	+4.53%	$4,677	+15.50%	$5,189	-3.94%
New orders (SA, $ millions, May)	$5,313	$5,384	-1.32%	$4,846	+9.64%	$5,299	-0.27%
Unfilled orders (SA, $ millions, May)	$18,667	$18,756	-0.47%	$18,980	-1.65%	$18,133	-2.86%
Inventory-to-shipment ratio (SA, May)	1.90	1.97	—	2.09	—	2.00	—
All employees (thousands, May)	504.5	503.7	+0.16%	479.4	+5.24%	489.2	-3.03%
Production workers (thousands, May)	167.3	167.5	-0.12%	159.3	+5.02%	155.0	-7.36%
Exports ($ millions, April)	$1,861	$2,175	-14.44%	$1,392	+33.71%	$1,835	-1.40%
Imports ($ millions, April)	$1,749	$2,051	-14.72%	$1,411	+23.98%	$1,800	+2.87%

SA = seasonally adjusted, all other data is not seasonally adjusted

Data sources: Federal Reserve Board, U.S. Bureau of the Census and U.S. Bureau of Labor Statistics
All data for SIC 357, except industrial production, SIC 357-9. Forecasts: Cahners Economics

Communication equipment — New orders

Quarterly totals, seasonally adjusted ($ billions)

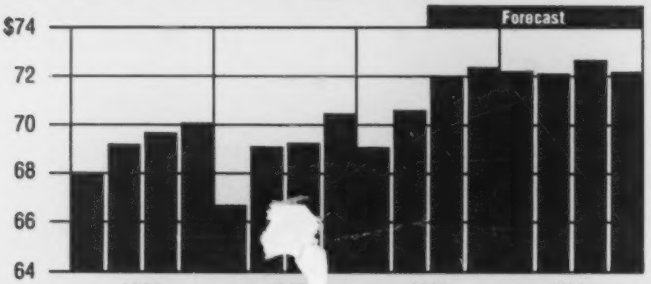


SIC 366

Historical data: U.S. Commerce Department; Forecast: Cahners Economics

Communication equipment — Unfilled orders

End-of-quarter totals, seasonally adjusted ($ billions)

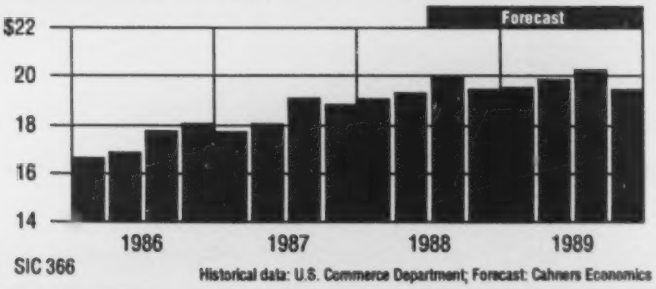


SIC 366

Historical data: U.S. Commerce Department; Forecast: Cahners Economics

Communication equipment — Shipments

Quarterly totals, seasonally adjusted ($ billions)

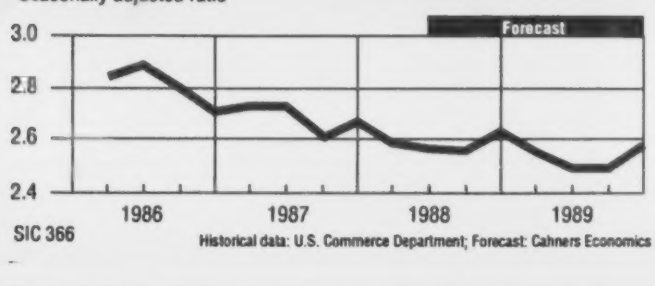


SIC 366

Historical data: U.S. Commerce Department; Forecast: Cahners Economics

Communication equipment — Inventory-to-shipments

Seasonally adjusted ratio



SIC 366

Historical data: U.S. Commerce Department; Forecast: Cahners Economics

Good and bad news in communications

The good news for communication equipment manufacturers is that new orders and shipments for the first six months of the year were running about 7% to 8% above the year-ago levels. The bad news is it looks as though growth rates peaked in the first quarter, so the slowdown already has started.

Tapering off in orders and shipments was expected, given the leaner times at the Department of Defense. About 40% to 60% of communication equipment shipments are classified as defense purchases. These are mainly radar, sonar and navigation equipment. Sales of defense-related communication equipment grew at double-digit rates from 1980 through 1986, but since 1983, the growth rate, although still positive, has been shrinking. By the end of this year, defense communication equipment shipments may actually be less than the total for 1987. That would mark the first annual decline since 1975.

An extended Taft freeze through October 1 on new DOD contracting is further tightening the procurement budget. According to the American Electronics Association, one of the areas hardest hit will be office automation equipment and support for information technology and equipment maintenance.

Obviously, the commercial sector has been the driving force for the communication equipment market this year. Measured in constant 1982 dollars, private sector purchases of communication equipment totaled an annualized $36.7 billion in the first quarter of this year. That is an 8% advance over the first three months of last year. But, even in the commercial arena, a softening in orders and shipments growth is evident. Users appear to be hesitant in their buying, even though prices have dropped.

Although growth rates are dwindling in the nondefense sector, they won't fall into the negative zone, even during the overall economic sag next year and in early 1990. This crawl will keep sales of communication equipment heading up. Look for sales increases of about 5% in 1988 and 1% to 2% next year.